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DECEMBER 1983
BRITAIN'S BIGGEST-SELLING HOME COMPUTER MAGAZINE
Vol. 3 No. 12
SPIRIT OF CHRISTMAS TO COME:
Unwrap presents from the future
Vic and 64 software survey
Choosing printers and
£100-£400 micros
Dragon Sky Shield
BBC carol
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COMPETITION OF THE YEAR
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ZX-81/Spectrum
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NUMBER 1 IN GAMES SOFTWARE



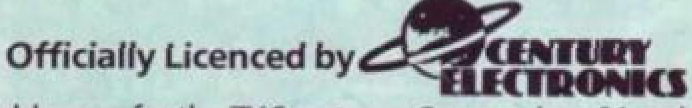
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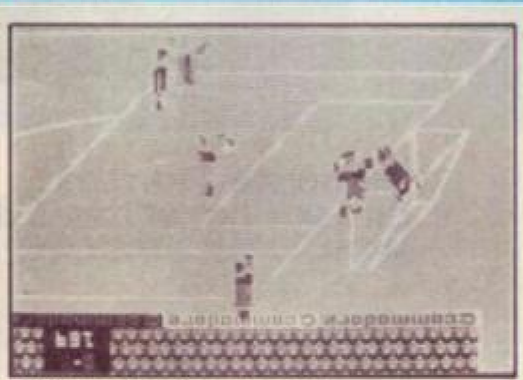
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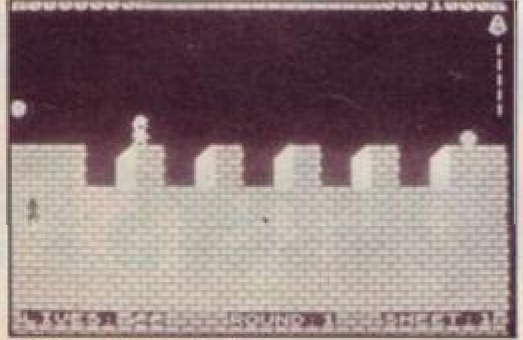
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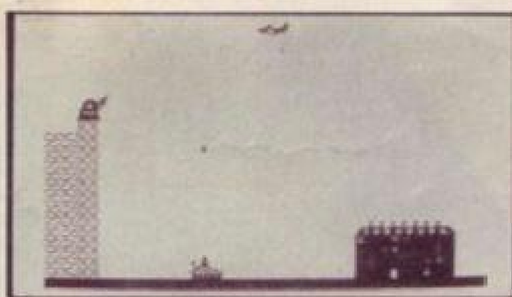
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YOUR COMPUTER Contents

DECEMBER 1983


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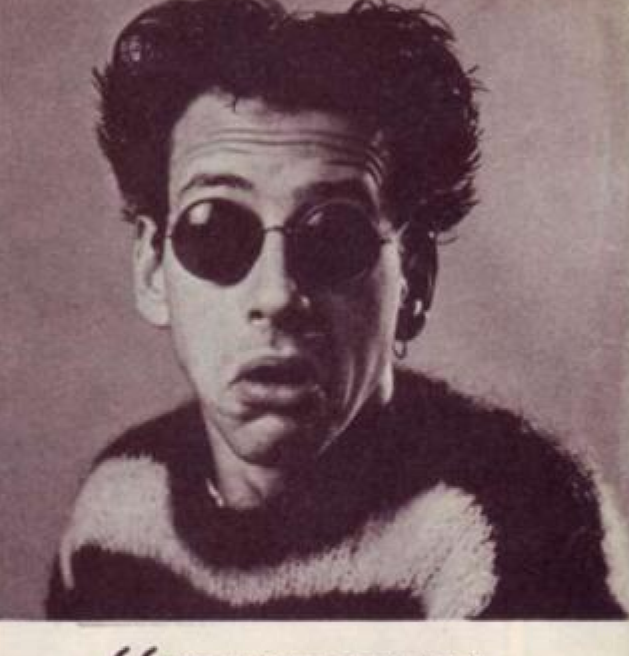
Above: ZX-81 bubble sort: page 183.

Below: The spirit of Christmas to come.


Electric Globe by Tony Bassett. 01-328 3861.







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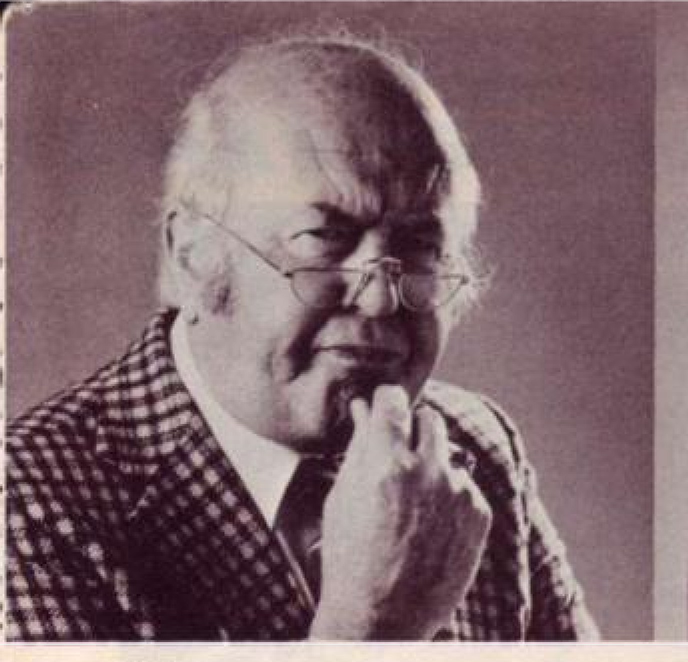
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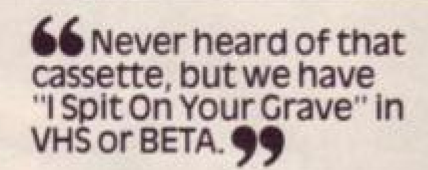
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software compatible standard

	SPECTRAVIDEO SV 328	SPECTRAVIDEO SV 318	APPLE II E	ATARI 800	COMMODORE 64	BBC MODEL B	DRAGON 32	SPECTRUM
COMPUTING POWER FEATURES								
BUILT-IN ROM	48K	32K	16K	10K	20K	16K	16K	16K
EXPANDABLE TO	96K	96K	N/A	42K	N/A	64K	N/A	N/A
BUILT-IN EXTENDED MICROSOFT® BASIC	YES	YES	YES	ADDITIONAL COST	NO	NO	YES	NO
BUILT-IN RAM	80K*	32K***	64K	48K	64K	32K	32K	16K
EXPANDABLE TO	256K**	256K**	64K	NO	N/A	32K	64K	48K
KEYBOARD FEATURES								
NUMBER OF KEYS	87	71	63	61	66	73	53	40
USER DEFINE FUNCTIONS	10	10	N/A	4	8	10	N/A	N/A
SPECIAL WORD PROCESSING	YES	YES	NO	NO	NO	NO	NO	NO
GENERATED GRAPHICS (FROM KEYBOARD)	YES	YES	NO	YES	YES	YES	YES	YES
UPPER/LOWER CASE	YES	YES	YES	YES	YES	YES	YES	YES
GAME/AUDIO FEATURES								
SEPARATE CARTRIDGE SLOTS	YES	YES	NO	YES	NO	NO	YES	NO
BUILT-IN JOYSTICK	NO	YES	NO	NO	NO	NO	NO	NO
COLORS	16	16	15	128	16	16	9	8
RESOLUTION (PIXELS)	256x192	256x192	280 x 160	320 x 192	320 x 200	256 x 640	256 x 192	256 x 192
SPRITES	32	32	N/A	4	8	N/A	16	N/A
SOUND CHANNELS	3	3	1	4	3	1	3	1
OCTAVES PER CHANNEL	8	8	4	4	9	3	5	3
A.D.S.R. ENVELOPE	YES	YES	NO	NO	YES	YES	NO	NO
PERIPHERAL SPECIFICATIONS								
CASSETTE	2 CHANNEL	2 CHANNEL	1 CHANNEL	2 CHANNEL	1 CHANNEL	2 CHANNEL	2 CHANNEL	1
AUDIO I/O	YES	YES	NO	YES	NO	NO	YES	NO
BUILT-IN MIC	YES	YES	NO	NO	NO	NO	NO	NO
DISK DRIVE CAPACITY	256K	256K	143K	92K	170K	100K	100K	100K
(LOW PROFILE)	YES	YES	NO	NO	NO	NO	NO	NO
CP/M® COMPATIBILITY (Standard 80 column programs)								
CP/M® 2.2	YES	YES	NO****	NO	NO*****	YES	NO	NO
CP/M 3.0	YES	YES	NO	NO	NO	NO	NO	NO

Specifications are subject to change without prior notice

* 64K user addressable plus 16K graphic support
** 240K user addressable plus 16K graphic support
*** 16K user addressable plus 16K graphic support
**** Apple II can accept modified 40 or 80 Column CP/M
***** Commodore 64 accepts 40 column CP/M

MSX, Microsoft Extended BASIC is a trademark of Microsoft Corporation
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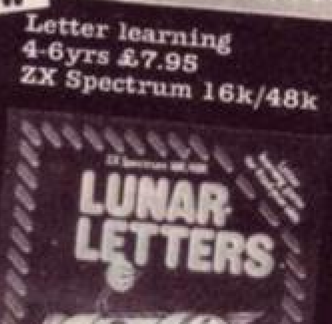
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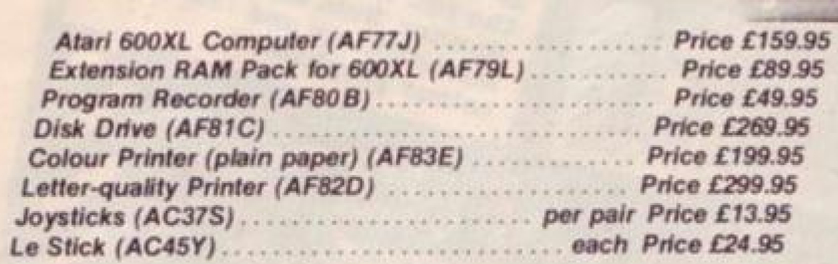
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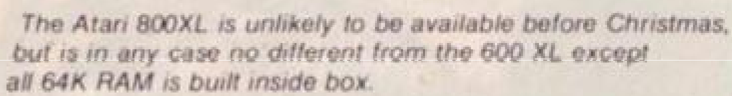
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- ★ 4 special function keys.
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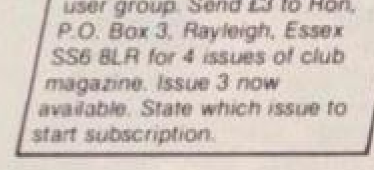
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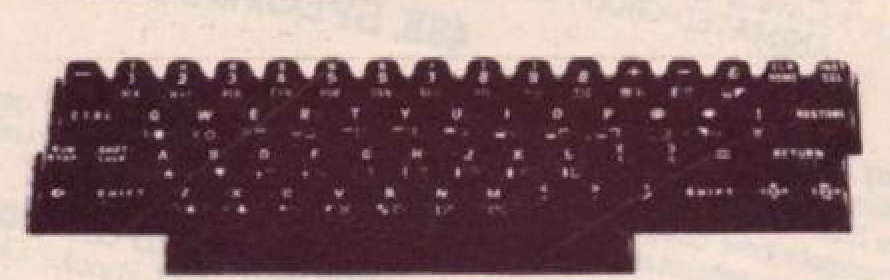
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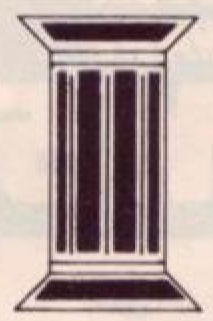
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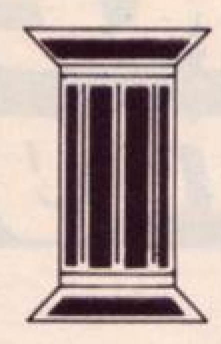


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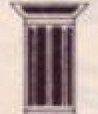
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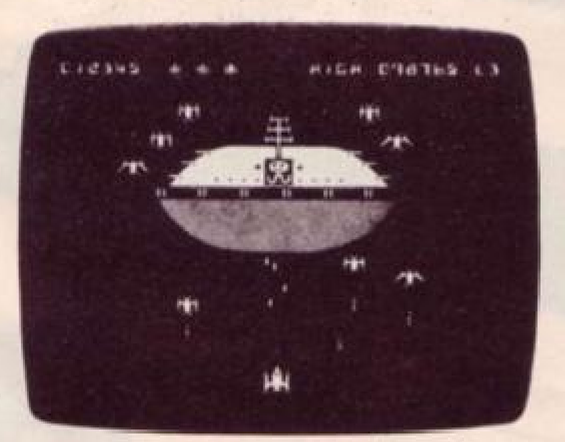
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Colour Genie is now one of the most successful home computers that you can buy.

Not just because of price.

But simply because more families are realising that a computer with less all-round performance than the 32K Colour Genie is a waste of money and not so rewarding.

After all, you cannot tell what will interest you most until you've tried everything computers can offer you.

Some others ask you to compare the technical facts. Well, to give them all a surprise we've published some of 32K Colour Genie's most important features.

But for the less technical, here are a few other important questions and answers.

WHY YOU CAN'T BUY A COLOUR GENIE AT THE CORNER SHOP

You see, ALL computers are more complex than they first appear.

So when you start computing, you do need a bit of help. A Saturday shop assistant is NOT the right person to go to.

To ensure that you obtain the answers to any doubts or questions you may have about computers, a list of the many Genie specialists appears below. But if you have any problem whatsoever, get in touch with us at Lowe Computers — we're here to help.

WHY OUR 32K CAN MEAN A LOT MORE THAN EVEN THE MOST RECENT COMPETITORS

It's easy to quote big memory numbers like 32K. In many other popular computers of that size, it is not so easy to use it all.

Even some of the newest models let you use little more than two thirds of the user memory. The other third is snatched away to drive the computer.

- Design efficiency. 95% of RAM is available for user memory
- 16K ROM with Microsoft Colour BASIC Extended
- Forth (optional)
- 256 predefined characters with 128 more you can program yourself. A massive 256 can be displayed at any one time
- Repeat operates on all 63 keys
- 4 function keys giving 8 user programmable statements
- Full editing and tracing facilities for de-bugging
- Screen resolution of 320 x 200 with text and graphics
- Or 160 x 102 individually addressable pixels in 4 colours
- Screen display, 25 rows of 40 characters
- 16 colours (8 full, plus 8 tints)
- 80 commands plus more than 40 graphics, arithmetic and special functions
- 8 octaves, independent on each of 3 separate sound channels with independent volume, duration and envelope on each channel
- Full synthesised sound effects via separate T.V. or Hi-Fi output ports
- Cartridge based software
- Prestel/Viewdata modem. Software cartridge loaded for fast system access
- Floppy disc system
- Superb digital joysticks, with numeric pads and two fire buttons

Colour Genie has the type of "drive" facility that you would expect to find on a computer costing around £400. It uses less than 5% of RAM - giving you as much as 30K for more exciting games and more useful applications.

WHY GOOD PICTURES CAN BE MORE COLOURFUL ON THE COLOUR GENIE

Many other computers offer several modes. These give high resolutions but at a cost.

On some, high resolution uses so much RAM that you get only 2 colours, and very little memory left to play with.

But Colour Genie has got other ideas to let you have the good quality picture effect of high resolution (320 x 200 for the technical). AND FULL COLOUR

THIS IS HOW IT WORKS.

Colour Genie lets you create as many as 128 different shapes that it tucks away in its memory, in addition to the 128 shapes it has permanently stored (you can see 64 of them on the keys in the photograph).

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So you can compose pleasant music –or drive everyone out of the house!
WHY COLOUR GENIE IS A TOUCH HEAVIER THAN MOST OTHERS
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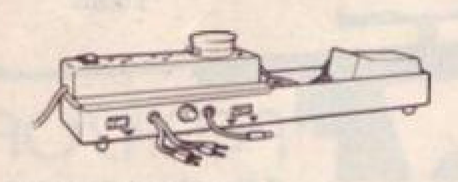
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ENJOY MATHS 48K Spectrum £8.00
A suite of 4 highly motivating programs for the 8 - 14 age range: tables, simple equations, polygons and areas. The programs combine explanation with tests and make good use of colour and sound.

TOWNTEST BBC/B £6.50
Identify the major towns and cities of England, Scotland and Wales, displayed on a high-resolution map. Suitable for all age groups and for school or home use (try it as a quiz for all the family!)

BIOLOGY BBC/B £12.50
A major collection of programs, written by a GCE examiner, designed to aid the understanding of Biology to CSE, 'O' and 'A' Level standards. These programs - comprising text, animated diagrams and questions - are available in one package and are suitable for individual study at school or in the home. Teachers will also find material suitable for class demonstration.

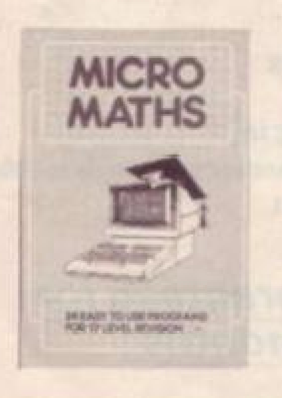
STRATEGY GAMES

PENTILES	BBC/B	£6.95
REVERSI (Othello)	BBC/B	£6.95

We require good programs to increase our catalogue and pay high royalty rates for published material.

Educational Software





BBC Micro
ZX Spectrum
unexpanded VIC
ZX81
Apple
PET

All software for the above computers.

MICRO MATHS 24 program revision or self-tuition course to O-Level. £24.50 (except ZX81 £14.50).

NEW **PICTURE PUZZLE** (BBC & Electron only). Full screen colour graphics. Teachers/Parents notes included. Ages 3-8 with help, 8-Adult without. £5.50.

ANIMATED ARITHMETIC Teaches using moving colour pictures (not words) Ages 3-8. £6.50 (disc £7.50).

MASTER MATHS (Apple and PET only). 50 program O-Level course or teacher's aid, amazing graphics.

". . . the programming standard is high. The programs are robust . . ."
TIMES EDUCATIONAL SUPPLEMENT

Immediate dispatch of BBC, Spectrum and ZX81 Micro Maths and Apple Master Maths. Phone or send orders or requests for free catalogue (180 programs) to:

World leaders in Maths educational software (distributers in 24 countries).

LCL
26 Avondale Ave.
Staines, Middx.
Tel:0784 58771



GENEROUS TRADE DISCOUNTS.

ORIC AND SINCLAIR COMPUTERS



Oric 1 computer 48K £143 (£141) £151. Oric 1 16K £110 (£112) £122. Oric colour printer £134 (£123) £140. Sinclair Spectrum 48K £131 (£131) £143. Spectrum 16K £101 (£105) £117. 32K memory upgrade kit for 16K Spectrum (issue 2 only) £31 (£28) £30. ZX printer with 5 free rolls paper £41. ZX printer alone £36 (£38) £50. 5 printer rolls £13 (£16) £21. ZX-81 £37 (£37) £47. Special offer pack ZX-81 computer + 16K ram pack + game tape £49 (£55) £65. ZX-81 16K ram packs £31 (£28) £30.

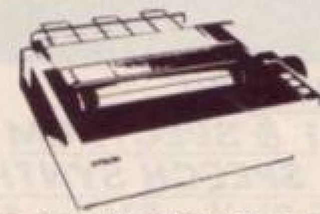
COMMODORE COMPUTERS

Commodore 64 £233 (£209) £229. Vic-20 with free cassette recorder, basic course and games £143 (£149) £179. Convertor to allow most ordinary mono cassette recorders to be used with the Vic-20 and Commodore 64: — built £9.78 (£9) £11, kit £7.47 (£7) £9. Commodore cassette recorder £43 (£44) £50. 1541 Disc drive £233 (£209) £234. 1525 Printer £235 (£220) £245. 1526 Printer £350 (£330) £360.

ACORN COMPUTERS

Electron £203 (£209) £229. BBC Model B £404 (£368) £388. Kenda double density disk interface system for beeb £174 (£155) £165. We stock the whole range of Cumana disc drives for the beeb e.g. 100K single £230 (£220) £240. Double 2 x 400K £625 (£560) £580.

PRINTERS



Epson RX80 £326 (£309) £340. Epson RX80F/T £346 (£316) £346. Shinwa CTI CP80 £293 (£271) £312. Epson FX80 £440 (£408) £438. Epson MX100/3 £494 (£465) £495. Seikosha GP100A £234 (£219) £254. Oki Microline 80 £243 (£227) £268. Oki Microline 84 £831. The Ultra 21 combined daisy wheel and electric typewriter £438 (£415) £445. The brother EP22 combined matrix printer and electric typewriter £173 (£166) £186. Juki 6100 proportional daisy wheel printer £423 (£404) £434. MCP40 colour printer £134 (£123) £140. Star STX80 thermal printer £165 (£159) £169. We can supply interfaces to run all the above from Sharp computers £58 (£52) £55.

UK101 AND SUPERBOARD

We still support these gorgeous machines. Write for our tempting list of add ons.

SWANLEY ELECTRONICS
The Computer Export Specialists
Dept YC, 32 Goldsel Rd., Swanley, Kent BR8 8EZ, England.
Tel: SWANLEY (0322) 64851

Nothing extra to pay. All prices are inclusive. UK prices are shown first and include p&p and VAT. The second price in brackets is for export customers in Europe and includes insured air mail postage. The third price is for export customers outside Europe (including Australia etc) and includes insured airmail postage. Official orders welcome.

sinclair special

5



Inside...
New Interface 2 and ROM cartridges!
New Software!

SOFTWARE UPDATE

The latest cassette software for ZX® Computers

TAKING NEW SOFTWARE IN NEW DIRECTIONS

You'll see that this issue of Sinclair Special devotes considerable space to software. Why, when we've so much to say about hardware and peripherals? Simply because at Sinclair we believe in supporting first-class hardware with first-class software.

This month sees the start of a new commitment to education in our catalogue, both for adults and children.

In the field of micro theory, we've programs like Beyond BASIC and Make-a-Chip, which take you from the creation of simple ZX® assembler subsets to simulated circuit design projects.

There's Musicmaster, to teach you music terminology, note values and composition.

And if you're keen to beat your Spectrum at chess (which can be hard), you'll certainly want to try Chess Tutor 1, the first program in a complete chess masterclass.

Coming soon...

In the pipeline are many new releases, some of which break completely new ground. LOGO and micro-PROLOG for instance. They're fifth generation languages which will take you and your Spectrum closer than ever before to the creation and application of artificial intelligence.

A formal agreement between Sinclair and Macmillan Education has been announced, the first results of which will be published this autumn. These consist of five programs in a complete early reading course plus the first four of a series of programs based on Macmillan's top selling Science Horizons Scheme. All programs are designed for use in schools or the home.

And with Blackboard software, we're publishing six more home education programs for primary school children. Covering alphabet, spelling and punctuation, each of these programs is a true gem, unlike any other education software, and fascinating to run. Even for adults!

I believe that these new titles represent a major advance in educational software for the home.

New ROM software too!

You may well have heard news of ZX Interface 2® and ROM cartridge programs. You'll find full details of the Interface and its software on the facing page (and there's an order form on the back page too!). These offer an instant games playing facility at unbeatable prices, and expand the possibilities of using your Spectrum in yet another direction.

Alison Maguire

Alison Maguire
Applications Software Manager



Chess Tutor 1

For 48K RAM Spectrum. **£9.95.**

Chess Tutor is a new way of learning all about chess – using your ZX Spectrum.®

It starts from the beginning by teaching you about the chess pieces and the way they move – including castling, en passant, promotion, check, checkmate, stalemate and perpetual check.

Then it teaches you the basic tactics – pins, forks, double attacks and skewers.

There are over 120 exercises and over 200 questions for you to answer – with demonstrations and hints from your ZX Spectrum when you want them.

You can choose which parts of the course you want – and even experienced players may be surprised at what they can learn from Chess Tutor.

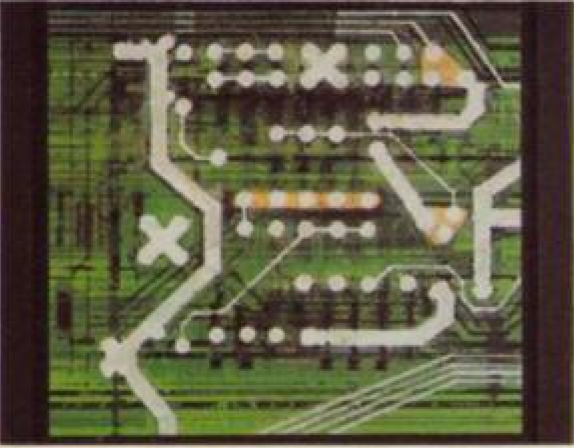
Musicmaster

For 48K RAM Spectrum. **£9.95.**

Musicmaster turns your ZX Spectrum into a musical instrument which will not only play tunes, but will also demonstrate key signatures, durations of notes, and scales.

You can write your own tunes – in any key – play them over and over again, save them on tape, modify them.

You can either write your music on a stave, or place a simple overlay on your Spectrum for a 17-note keyboard.



Make-a-Chip

For 48K RAM Spectrum. **£9.95.**

Make-a-Chip teaches you the basic elements of circuit design, shows you how they fit together, and then lets you design and test your own circuits.

When you have designed a circuit, you can give it inputs and outputs and your ZX Spectrum will check it for you. Then it will run it, or tell you what's wrong so that you can modify it.

Make-a-Chip is a fascinating way of finding out how computer logic works.

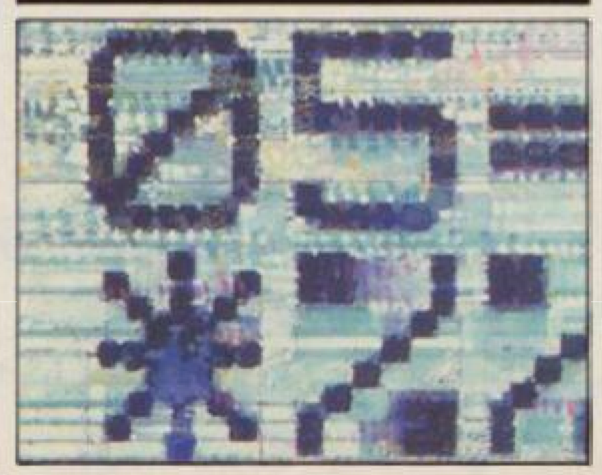


Print Utilities

For 16K and 48K RAM Spectrum. **£9.95.**

Increase the printing and display facilities of your ZX Spectrum with the Print Utilities program.

Print Utilities enables you to enhance your programs by generating characters of eight different sizes which you can place anywhere on your screen.



Beyond BASIC

For 48K RAM Spectrum. **£9.95.**

Takes the agony out of assembler. Takes the mystery out of machine code.

Beyond BASIC gives you a deeper insight into the workings of your ZX Spectrum. It explains what happens inside your micro when you run a program, and it teaches you simple Z80 machine code programming.

A major feature of Beyond BASIC is that it enables you to write your own Z80 assembler programs – then you can actually see on your screen how they affect the ZX Spectrum memory and registers.

ZX INTERFACE 2®

The New ROM Cartridge/Joystick Interface

Loads programs instantly! Takes two joysticks! Just plug-in and play!

The ZX Interface 2 is the latest new peripheral for the ZX Spectrum® system. It enables you to use new ZX® ROM cartridge software: plug-in programs that load instantly. It allows you to use two standard joysticks, without the need for separate, special interfaces.

To use new ZX ROM cartridge programs, just connect Interface 2 to the rear of your Spectrum or Interface 1 and plug in the cartridge of your choice. The program is then loaded, ready to run!

You can use any joystick that has a 9-way D plug. Use one or two of them for extra fun with ZX ROM cartridge or Sinclair cassette programs – or with dozens of other Spectrum-compatible programs!



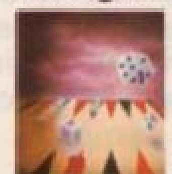
...AND BRAND NEW ROM CARTRIDGE SOFTWARE!

There's already plenty of choice of ZX ROM cartridge programs for your Spectrum. Some are old favourites, in an exciting new form. Others are new.

And now, thanks to ROM cartridge technology, you can run them *all* on a 16K RAM Spectrum, even if they were originally written only for 48K machines!

Every ROM cartridge program loads fast and faultlessly. No wires, no waiting, no worries about loading errors! All of them are affordably priced too, at £14.95.

Backgammon



Everything you need to play the famous and deceptively simple board game. Board, stones, rolling dice and doubling dice are shown in full colour and high resolution. Choose from four levels of skill to suit experts and beginners alike – full rules are included.

Space Raiders



Your skill is all that's stopping successive waves of aliens from destroying Earth. Use your gun base to attack. Shelter behind buildings... move out and blast the passing alien soaceship!

Full-colour high-resolution graphics with sound.

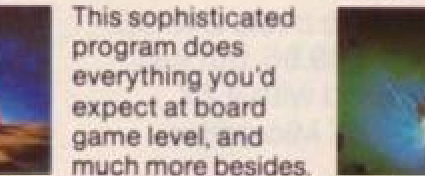
New! PSSST



Robbie the Robot sits in his garden. Help him fetch compost to cultivate his prize Thyrgodian Megga Chrysanthodil. Help him make the right choice of pesticide, to ward off devilish insects. Stop the insects breeding to overwhelming numbers before Robbie's plant has bloomed. PSSST is horticulture with a horrendous twist!

One and two player option, with a host of features including sound effects.

Chess



This sophisticated program does everything you'd expect at board game level, and much more besides.

The high-resolution chessboard and pieces are arranged in a row and column system, so it's easy to key in your moves.

At any stage of the game you can request the computer to suggest a move, reverse roles or change the level of skill.

Full-colour high-resolution graphics.

Planetoids



Dodge and swerve using your thrust button, turn on a planetoid... fire! But beware – the alien ship moves fast to destroy you with cluster bombs. And when it comes to the crunch, use your hyperspace button!

Full-colour high-resolution graphics with sound.

Hungry Horace



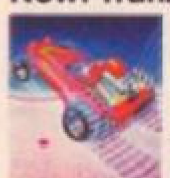
Horace is forever being chased around the park by guards.

He steals their lunch, eats pathway flowers and creates chaos in the park by ringing the alarm!

You'll have to be quick to keep Horace out of trouble!

Full-colour high-resolution graphics with sound.

New! Tranz Am



Set in a future time ruled by cars and trophies, in a land where petrol replaces gold, and status is possession of the 8 Great Cups of Ultimate.

Driving your Super Blown Red Racer, use your skill to outwit and crash the Deadly Black Turbos. Use your instruments to locate and collect the trophies – before you overheat or run out of fuel.

A program with outstanding multi-directional movement, graphic features, and a playing area equivalent to more than 600 times actual screen area.

Horace and the Spiders



Guide Horace on the hazardous journey to the cobwebbed house full of poisonous spiders.

Safely in the house, you must move along cobwebs, choose a spot... and jump on it! The spiders will be in a frenzy – scuttling to repair their precious web.

And when a spider is spinning a new section, you're safe to attack and destroy it!

Kill all the spiders, and a new web appears... with even more spiders to catch.

Full-colour high-resolution graphics.

New! Cookie



You're Charlie the Chef, who keeps his ingredients locked in the larder. But if the ingredients escape, they bring the inedible Nasties with them!

You must daze the escaping ingredients with flour bombs, and knock them into the mixing bowl. Stop them getting into the dustbin, at all costs! And beware of Nasties that get into the mixing bowl!

Cookie is fast-moving panic in the pantry, with a cast of real characters. A program to make you smile – and sweat!

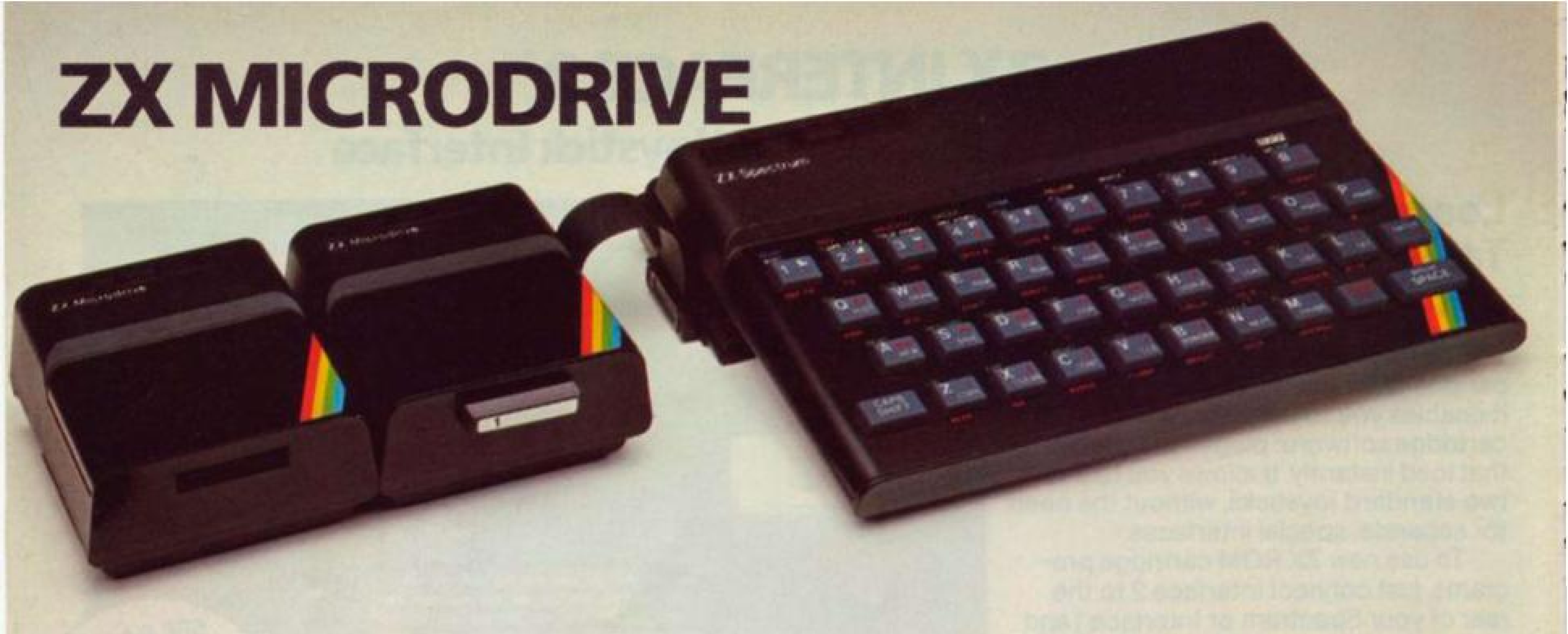
New! Jet Pac



As Chief Test Pilot of the Acme Interstellar Transport Company, your task is to deliver and assemble spaceship kits. On your way round the galaxy, you're free to collect precious stones and gold.

The catch? Rocket fuel is precious and scarce. And the aliens don't take kindly to the theft of their valuables. You'll need your wits and your lasers!

With a host of features, including multi-directional movement, explosions, sound effects and one and two player option.





NOW ON RELEASE

The ZX Microdrive® System – as you'd expect from Sinclair – is unique to the world of computing. It's a compact, expandable add-on system which provides high-speed access to massive data storage. With just one Microdrive alone (and Interface 1), you'll have at least 85K bytes of storage, the ability to LOAD and SAVE in mere seconds, the beginnings of a local area network of up to 64 Spectrums, *and* a built-in RS232 interface! The cost? Less than £50 for each Microdrive.

How to get ZX Microdrive

Spectrum owners who bought direct from us, by mail order, have been sent full details. Order forms are being mailed in strict rotation, so if you haven't yet received your order form please bear with us. We're making good progress in meeting the huge demand.

If you didn't buy your Spectrum by mail order, don't worry. Send us the form from the bottom of this page. We'll add your name to the mailing list, and send you details by return.

Each Microdrive costs £49.95. Interface 1 costs £49.95, but just £29.95 if purchased with a ZX Microdrive. Extra ZX Microdrive cartridges: £4.95.

How to order

Simply fill in the relevant sections on the order form below. Note that there is no postage or packing to pay on some purchases. Orders may be sent FREEPOST (no stamp needed). Credit card holders may order by phone, calling 01-200 0200, 24 hours a day. 14-day money-back option, of course. Please allow 28 days for delivery.

*ZX, ZX Spectrum, ZX Interface and ZX Microdrive are all registered trade marks of Sinclair Research Ltd.

sinclair®

Sinclair Research Ltd, Stanhope Road, Camberley, Surrey, GU15 3PS. Telephone: (0276) 685311.

To: Sinclair Research Ltd, FREEPOST, Camberley, Surrey, GU15 3BR.

ORDER FORM

Section A: Hardware

Qty	Item	Code	Item Price £	Total £
	ZX Interface 2	8501	19.95	
	ZX Spectrum – 48K	3000	129.95	
	ZX Spectrum – 16K	3002	99.95	
	Postage and packing: orders under £90	0028	2.95	
	orders over £90	0029	4.95	
			TOTAL £	

Section B: Software ROM CARTRIDGE PROGRAMS

Qty	Item	Code	Item Price £	Total £
	G12/R Planetoids	5302	14.95	
	G9/R Space Raiders	5300	14.95	
	G13/R Hungry Horace	5303	14.95	
	G24/R Horace and the Spiders	5305	14.95	
	G28/R PSSST	5307	14.95	
	G30/R Cookie	5309	14.95	
	G29/R Tranz Am	5308	14.95	
	G27/R Jet Pac	5306	14.95	
	G22/R Backgammon	5304	14.95	
	G10/R Chess	5301	14.95	

CASSETTE PROGRAMS for ZX Spectrum

Qty	Item	Code	Item Price £	Total £
	E9/S Chess Tutor 1	4308	9.95	
	E7/S Musicmaster	4306	9.95	
	E8/S Beyond BASIC	4307	9.95	
	E6/S Make-a-Chip	4305	9.95	
	L5/S Print Utilities	4404	9.95	
			TOTAL £	

*I enclose a cheque/postal order made payable to Sinclair Research Ltd for £ ______

*Please charge to my Access/Barclaycard/Trustcard account no: ______

*Delete/complete as applicable.

Signature ______

Mr/Mrs/Miss ______

Address ______

YOC 911

(Please print)

ZX Microdrive information request

Please add my name to the Microdrive Mailing List, *and* send me a colour brochure with full specifications of ZX Microdrive/Interface 1 ☐ *(tick here).* You can use the above form to send us your name and address.



Unlock Your Imagination

...with SCOPE Computer Graphics Language and write arcade-style game programs to compete with the professionals.

THIS sensational SCOPE utility and your Spectrum will unlock your imagination. It's amazingly simple and fast and enables you to write fast-moving games in MACHINE CODE.

SCOPE realises your potential and releases it. You'll amaze family and friends and surprise the professionals. *They said it couldn't be done.*

TECHNICAL DETAILS

SCOPE is a fully structured multitask compiled language, specifically for writing arcade-type games enabling you to program machine code without any knowledge of machine code.

SCOPE can be used as an assembler with SCOPE words as plain language mnemonics, therefore no knowledge of machine code is required.

Each command word will write into the program memory the relevant machine code.

It is generated from BASIC and is fully compatible with BASIC.

The language from the user end is very easy to comprehend and is comprehensive, providing many features not available from BASIC. SCOPE has to be used to be believed.

- *As fast as MACHINE CODE*
- *Simpler than BASIC*
- *Instruction Manual*
- *£11·95*

48K SPECTRUM

Unlock Your Imagination
SCOPE

SCOPE
Computer Graphics Language

CLIP THE COUPON NOW AND UNLOCK YOUR IMAGINATION

Post to: ISP Marketing Ltd, Crown House, 38b High Street, Godalming, Surrey. Tel: Godalming (04868) 24151 Money refunded if not satisfied and tape returned within 7 days. Please rush me ...... copies of the SCOPE computer graphics language tape and instruction manual at £11.95 (p&p free). (Cheques payable to ISP Marketing Ltd)

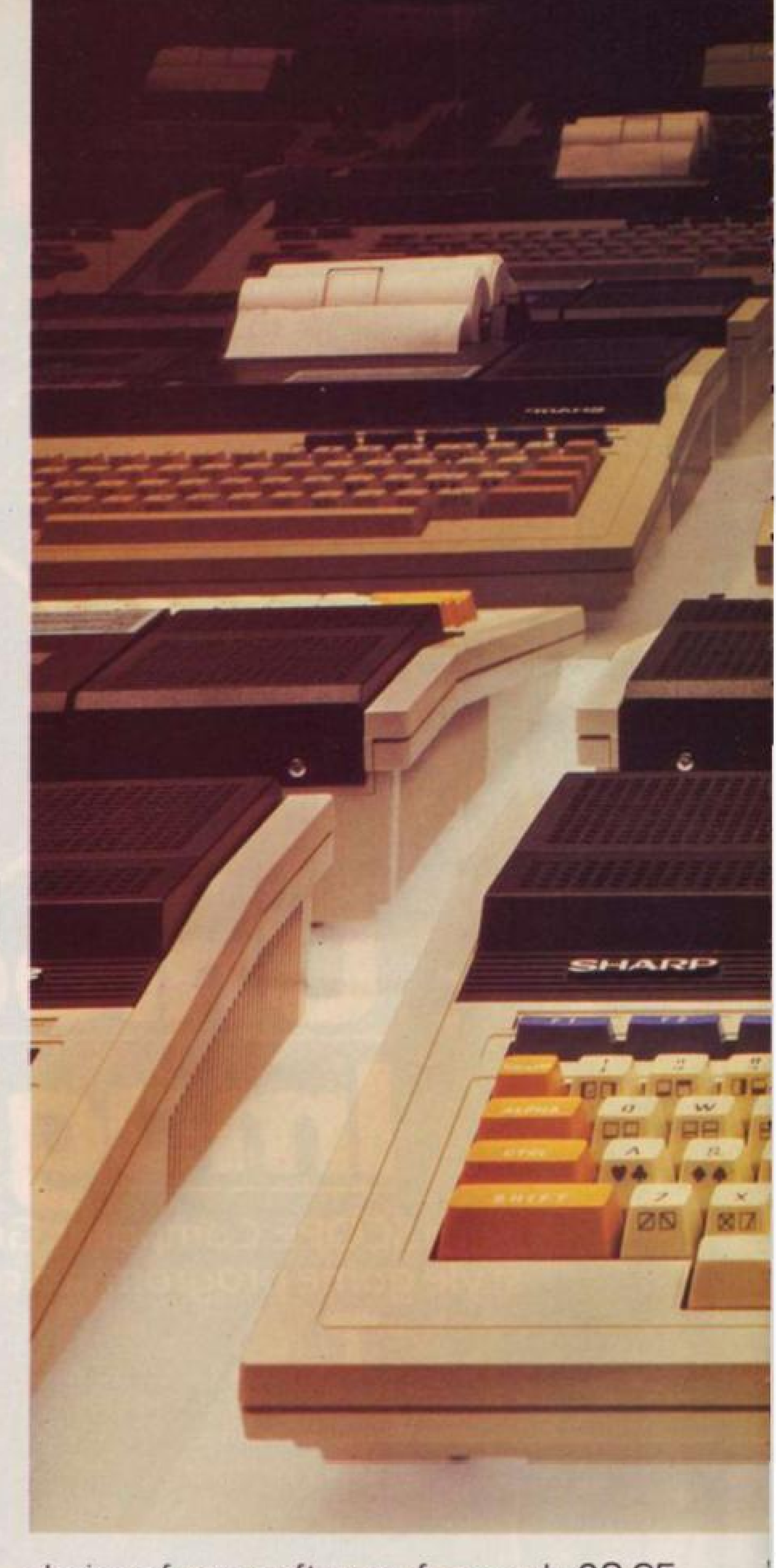
Block capitals please

Name ______

Address ______

Dealer Enquiries Welcome

NO LIMIT



Now, a home computer with virtually no limit to its possibilities. The astonishing new Sharp MZ700. A machine with a dazzling array of talents.

First, it's a 'clean' machine. So you are not limited to any one computer language. You have the flexibility to run and write programs in BASIC, FORTRAN, MACHINE CODE, PASCAL, ASSEMBLER and many others. And the MZ700's 512 predefined characters mean you can build up detailed pictures on the screen, without spending time specifying and designing special characters for games and special effects.

Second, it has a memory of 64K. So as your technique improves and develops, you are able to move forward to more and more advanced programming.

All of which makes this the perfect home computer for parents, as well as children.

The MZ700 gives you access to a wide choice of new software, from only £3·95 per cassette. An additional plotter/printer, costing £129·95, can produce high resolution graphics in 4 colours. A data cassette recorder is an extra at £39·95. Both add-ons fit snugly into this easy to carry compact system with no trailing wires. And you get ten exciting games, free on purchase, including Super Puckman, Circus Star, Snake v. Snake, and Man-Hunt.

The brilliant new MZ700.
The no-limit computer. £249·95. From Sharp. Where great ideas come to life.

CPU:	Z80A		1
ROM:	Monitor	4K byte ROM	1
	Character generator	4K byte ROM	1
RAM:	64K byte D-RAM		8
	4K byte V-RAM		2
1/O bus:	Expansion 1/O bus		1
	Additional printer 1/O bus		1
	Cassette READ/WRITE terminals		2
	Joystick terminals		2
RGB MONITOR/VIDEO MONITOR/RF OUTPUTS			



Look for this logo on software denoting Sharp Compatible Software.

To: Sharp Electronics (UK) Ltd,
Home Computer Division,
Sharp House, Thorp Road, Newton Heath,
Manchester M10 9BE. Tel: 061-205 2333

Please send me details of the Sharp MZ700.

Name ______________________

Address ______________________

____

______________________ YC1

The world of

SHARP

where great ideas come to life.

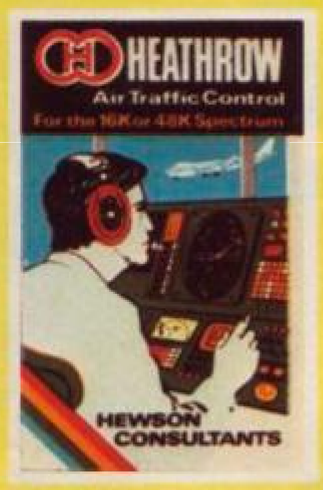




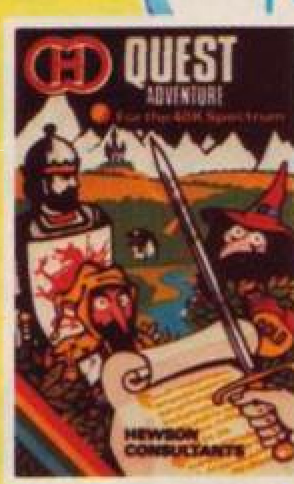
HEWSON CONSULTANTS

FOR SOFTWARE THAT CHALLENGES MIND AND DEXTERITY . . . WHATEVER YOUR TASTE, WE HAVE SOMETHING FOR YOU

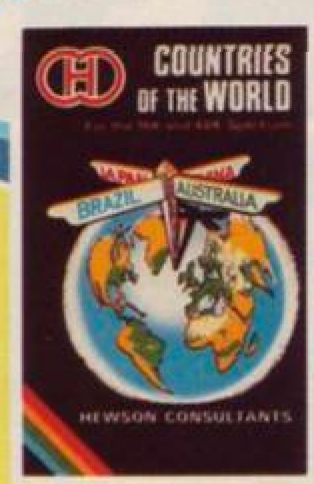
SPECTRUM



For the 16K Spectrum.
YOUR TASK: to direct incoming aircraft from holding stacks to runway – smoothly, safely and expeditiously.
YOUR INSTRUMENTS: Radar screen showing aircraft call signs, blips and trails. Four stack displays giving altitude, heading, speed and size.
SEVEN levels of play including a demonstration mode.
FEATURES: mixed aircraft, restricted airspace, minimum separation, outbound traffic, emergencies, unknown aircraft, radio failure, loss of a runway, instrument failure.



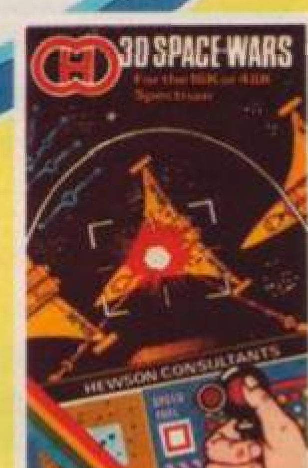
Find a map hidden in an inhospitable world inhabited by Dragons, Elves, Centaurs and other gruesome creatures. Role play the Wizard, Cleric, Rogue, Fighter or Simpleton each with different characteristics. Fight your way through the Gloomy Castle, Maze and Mountains etc. with weapons and Magic. Remember things are not always what they seem. For the 48K spectrum.



An educational package which gives an appreciation of the location of all the countries of the world. Includes two fully detailed world maps. 16K version – shows the location and names the capital. 48K version – All the above plus population, area, currency, main languages etc and comparative statistics on the largest and smallest countries etc.



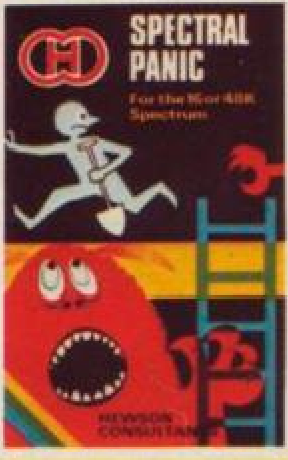
16K Spectrum. Defeat each squadron of Beeple Zaps and another appears only closer. Cyrian mothership with ejecting Zeetle Baps. 5 levels of play from Orions snail's pace to close your eyes and hope. Real time scoring. 3 lives. Pan galactic gargle blaster for highest score. Descending asteroids.



Fast and furious action. Joystick or Keyboard control. Locate the seiddab on your galaxy scanner. Scour the star studded blackness for your first sight of the enemy. Track their course and react rapidly as they try to break away. Let them grow in your sights and punch the fire button as they come into range.
16K or 48K Spectrum



For the 16K Spectrum.
8 levels of play from novice to expert. Full colour display of tables and dice. Gamble on a single game or a series, double or quits. All the features of the ancient game.

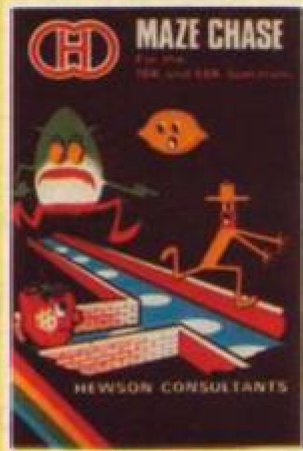


A fast moving action packed arcade game. Climb the ladders, dig holes, bury monsters, eat the power pill, move fast to avoid being eaten. On screen scoring, 3 lives.
16K or 48K Spectrum



New all machine code version of our highly successful flight simulator. Now with perspective cockpit view, improved instruments, detailed map, four beacons and other enhancements. Multiple levels of play to develop your flying skills. Complete with printed flight debrief at the end of your flight – signed by the program author! The most realistic simulator on the market. 16K or 48K Spectrum.



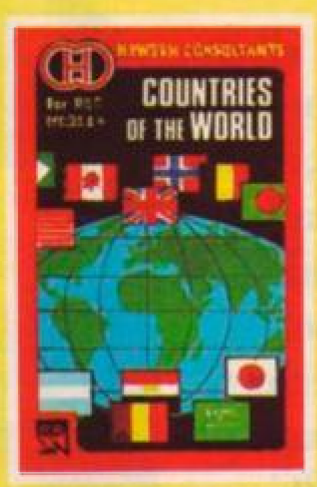


For the 16 and 48K Spectrum. 4 or 12 mazes, highest score to date, 4 independent guardians, 3 lives, full colour, fast machine code action, magic strawberries, eat lemons to score more, real time scoring.



HEWSON CONSULTANTS

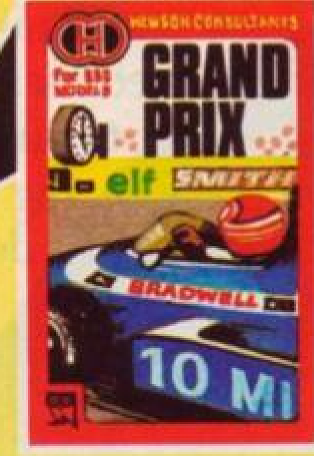
BBC



An educational package which gives an appreciation of the location of all the countries of the world. Includes detailed world map. Shows the location and names the capital plus population, area, currency, main languages, and comparative statistics on the largest and smallest countries etc. BBC Model B



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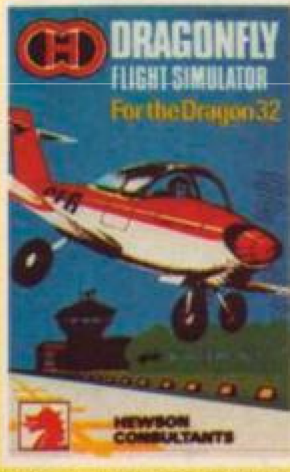
Steer your Formula One racer around one of five circuits – including Silverstone, Monza and Brands Hatch. Break the lap record only by strategy – and sheer courage. Pit stops, wet and dry tyres, chicanes, fire and weather hazards, means total concentration is needed – just to stay alive! BBC Model B.



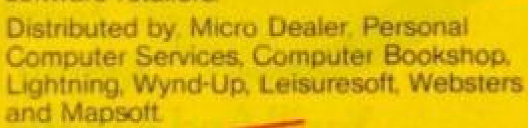
40 BEST MACHINE CODE ROUTINES FOR THE ZX SPECTRUM *by Andrew Hewson and John Hardman*
How to load and save machine code. How to use the system variables. How program lines are stored. How to use the stack, the display, the attribute files. ROUTINES. Scroll – up, down, side to side by pixel or by character. Rotate character, invert character – horizontally and vertically. Line renumber – including GOSUBs, GOTOs, RUN etc. and many more.

20 BEST PROGRAMS FOR THE ZX SPECTRUM by Andrew Hewson. Program titles include: Machine Code Editor. Index File – filing system for the ZX Spectrum. Duckshoot. Graphix – construct up to 210 graphics. Plus football, digitiser, diary and many more.

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Not all home computers stay at home.

The BBC Micro is the ideal family computer–simple to operate, yet fast, powerful, with enormous potential.

But it's nice to know, when you buy one for your home, that the business, educational and scientific worlds agree with your choice.

Here are a few stories to illustrate how the BBC Micro gets out and about. And one to remind you how helpful it can be when it stays at home.

A practical lesson in business admin.

The contribution of the BBC Micro in the classroom has long been recognised at Perins Community School in Hampshire.

The School has 12 BBC Micros used extensively across the syllabus: in fact some pupils are using them to study for their GCE O Levels in computing.

One of the programs available to Perins teachers such as David Beck, pictured below with his class, is "Newsagent."



This program contains all the necessary information for the class to run a newsagent's shop; allowing them to organise daily deliveries, make up bills and keep an eye on stock control and ordering.

It's a nice example of how the BBC Micro can be used not only to acquaint a class with the language of computers, but also with some of the realities of the community in which they live.

Correcting Jodrell Bank.

The BBC Micro is a familiar worker around Jodrell Bank.

You'll find it in the reception area explaining the workings of a radio telescope to visitors, for example.

But it's also been helping in a more testing task: to improve the performance of the Defford telescope.

In this application it has been used to make calculations necessary to determine the precise parabolic shape of the dish.

Theodolites are used to do the measuring–then the BBC Micro works out the necessary corrections.

The end of the scrawl.

If any of you have noticed how much easier it is to read and understand labels on drugs and medicines these days, then you can most probably thank the BBC Micro. John Richardson, a Preston pharmacist, was first to realise how a micro with a suitable printer could produce labels that were accurate and legible and which could include, automatically, such information as drug reaction warnings.

At the same time it could record drug usage for better stock control.

He chose the BBC Micro for its versatility and potential for expansion.

John Richardson believes that this system will be recognised as standard in the profession and be used in hospitals, health centres and pharmacies throughout the UK.

Meanwhile back at home.

Dr. & Mrs. Yarwood bought a BBC Micro as a birthday present for their 12 year old daughter.

However, it quite quickly became common property.

All three can now write their own programs. Mrs. Yarwood is particularly proud of one program she has compiled to help teach her daughter French vocabulary.

They all agree that although the Micro is fast and powerful enough to be at home in Jodrell Bank, it is also the ideal computer at the Yarwood home: simple to set up (virtually any TV set and cassette player is all you need) and simple to use.



All this for only £399.

The BBC Micro comes with a comprehensive, step-by-step User Guide which introduces you to your micro and shows you how to construct useful programs of your own.

You will also receive a free "Welcome" cassette which contains 15 different programs for you to experiment with, ranging from music and graphics to games like Kingdom and Bat 'n' Ball.

The BBC Micro is available from W H Smith Computer Shops, Boots, John Lewis and local Acorn stockists.

Alternatively if you would like to order one with your credit card or if you want the address of your nearest supplier just phone 01-200 0200 or 0933-79300.

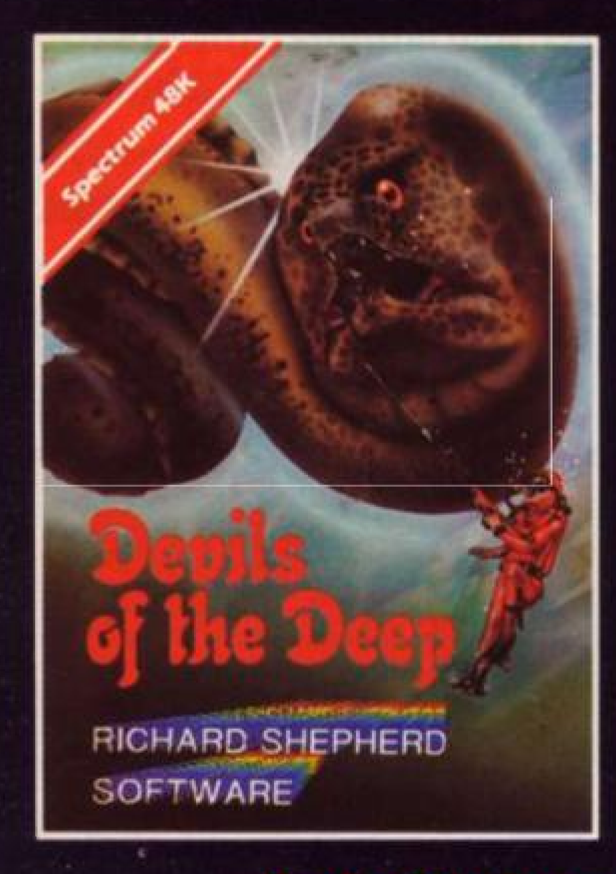


The BBC Microcomputer System.

Designed, produced and distributed by Acorn Computers Limited.

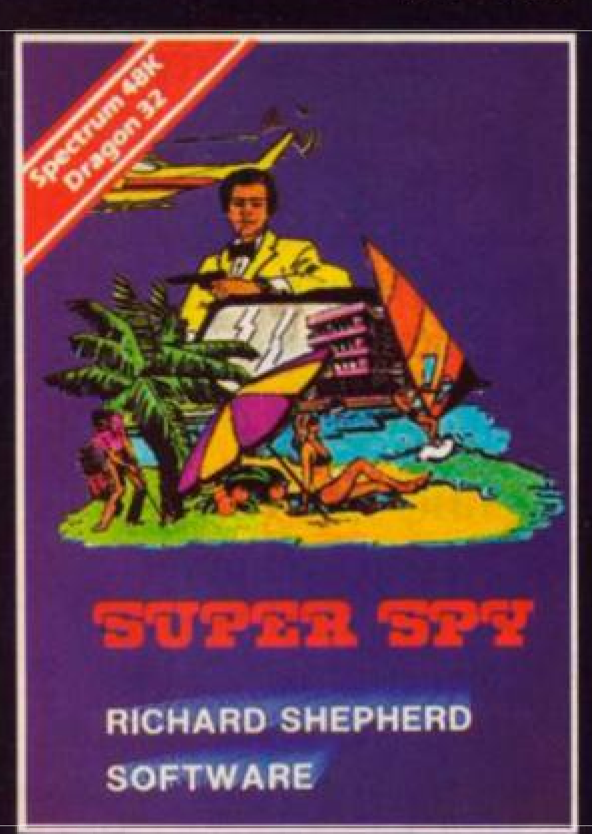
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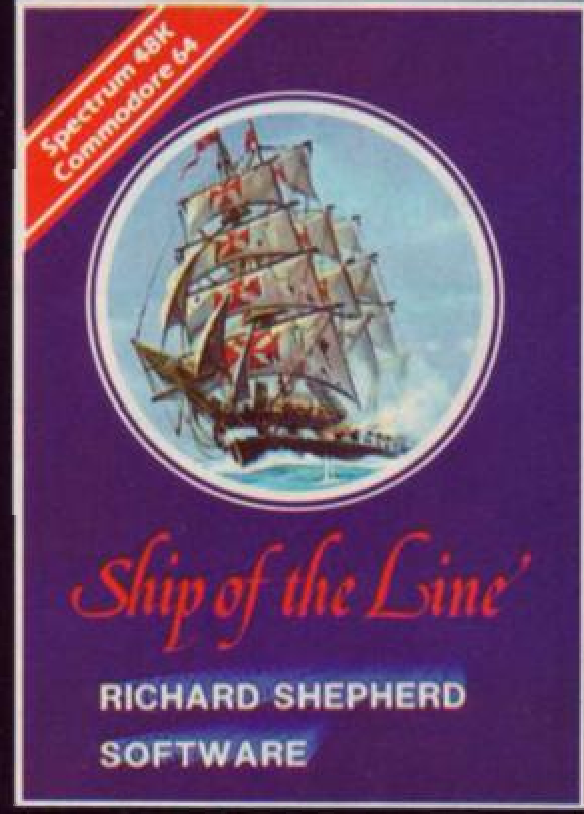
Invincible Island

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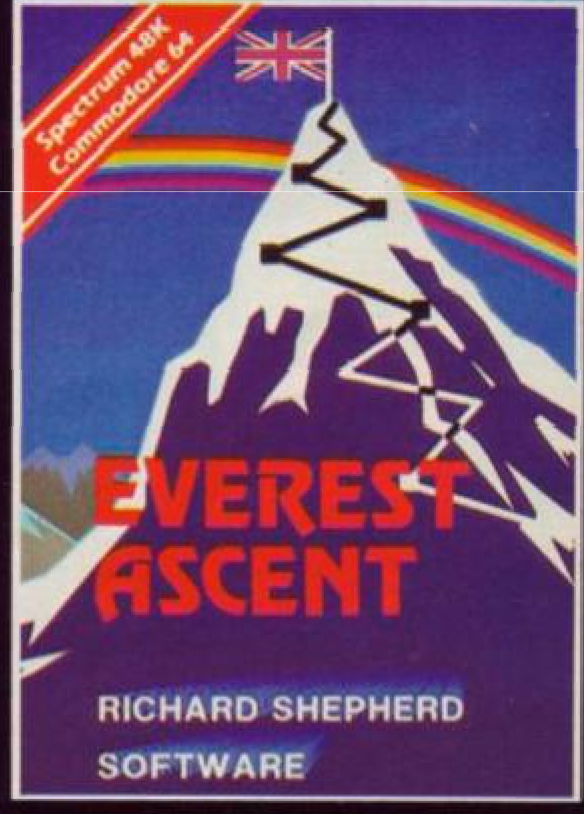
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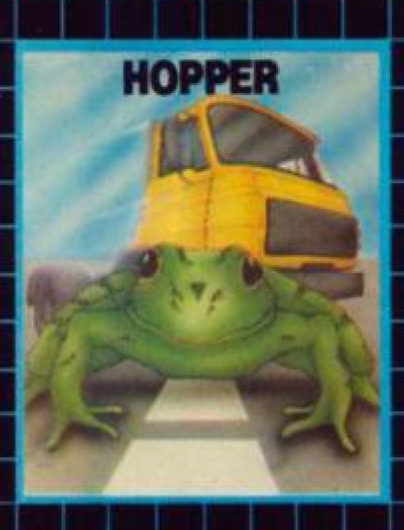
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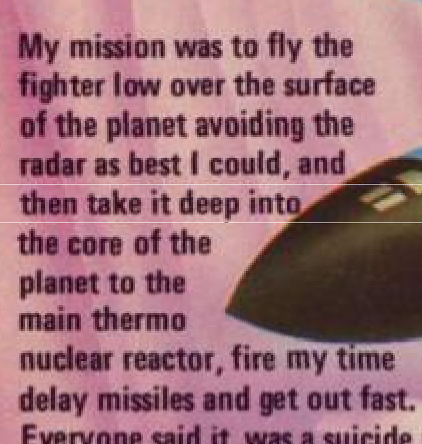












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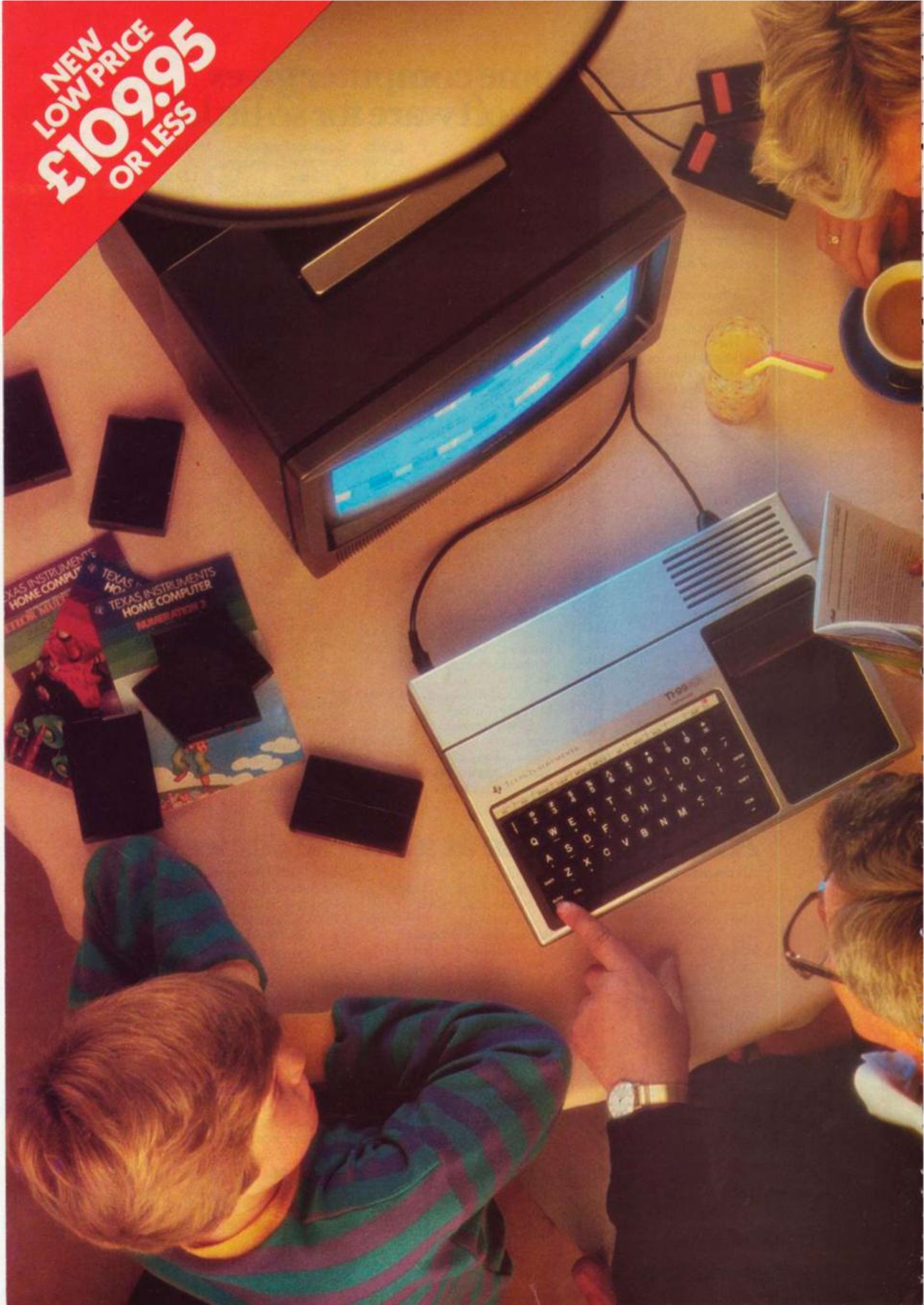
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The TI Home Computer is a real computer system

The TI Home Computer has got the memory power you might expect from more expensive computers, built in. At its heart is a powerful TMS 9900 16-BIT Microprocessor. Most other home computers have only an 8-BIT. And you can expand the memory from 16K of RAM up to 52K.

The total memory capacity is 114K Bytes.

A wide range of software for everyone

Another feature that makes the TI system so powerful, yet so easy to use is Solid State Software.™ These plug-in cartridges cover everything from space games like Parsec™ to teaching maths, managing home finances and composing music. And the range is getting wider all the time.

It even has what professionals look for in a home computer

CPU: TMS 9900 16-BIT, plus 256-byte Scratchpad RAM.
Memory: Total 114K bytes; 26K bytes ROM internal; up to 36K ROM cartridges external; 16K built-in RAM expandable to 52K bytes.
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More than one programming language

The standard programming language, TI BASIC, is built into your TI Home Computer so you can begin programming right away. But there's an expanded range of optional languages like Extended BASIC, TI Logo, USCD-Pascal, TI FORTH and Assembler.

With these you can fully expand your programming skills.

A wide range of peripherals

Most computers lose a lot of memory when you add peripherals. The TI Home Computer is different. Every peripheral comes with its own built-in programs to keep the loss of memory to a minimum.

The convenient Peripheral Expansion System houses up to eight peripherals. Additional hardware cards simply plug in. You can even add a complete Floppy Disk Memory System.

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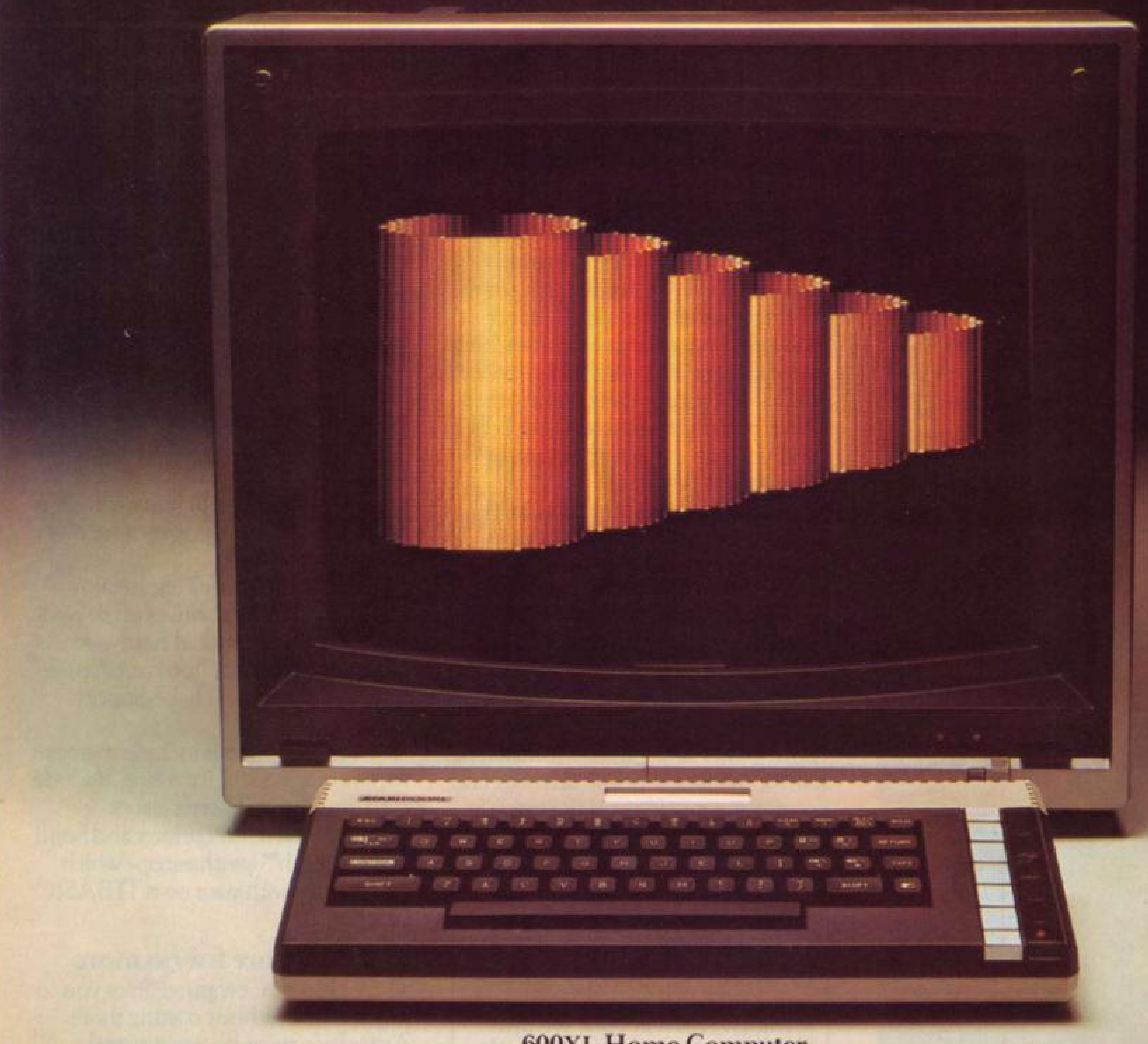
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Programming features. Built in ATARI BASIC programming language plus 8 other languages. HELP key will provide additional information and menu screens. Syntax checking on entry.

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Software: Over 1000 items of software available including self teaching programs with unique voice over. Education. Home management. Programming aids. Atari user written programs (APX). And Atari's famous entertainment software.

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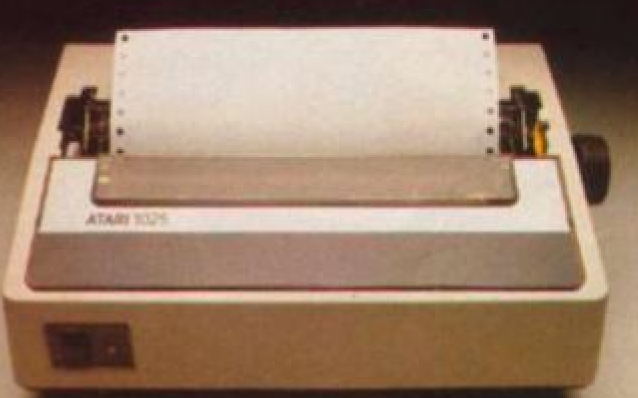
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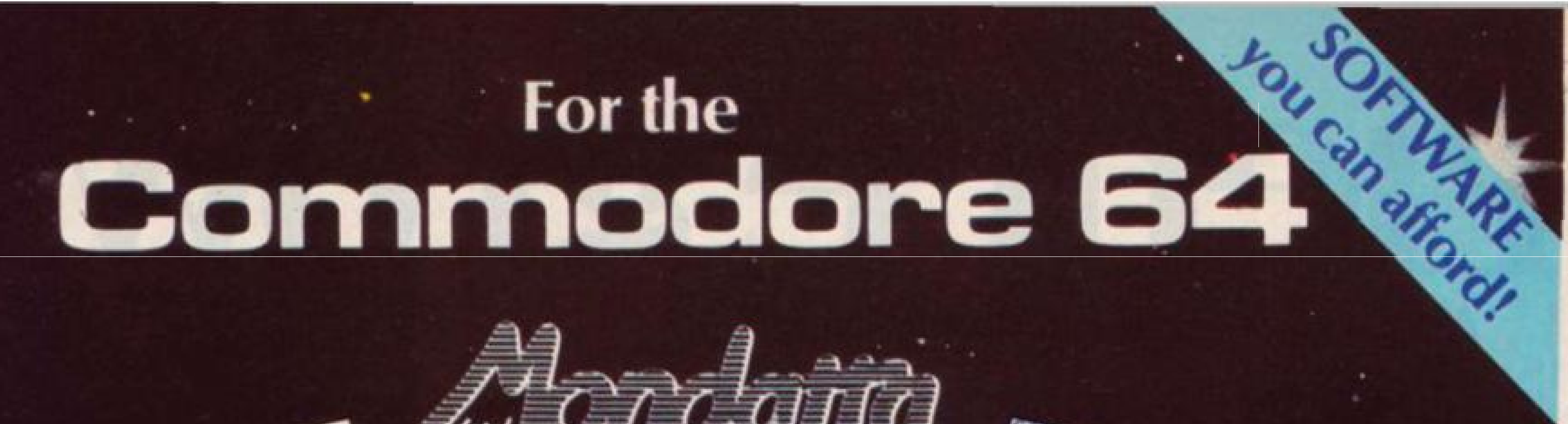
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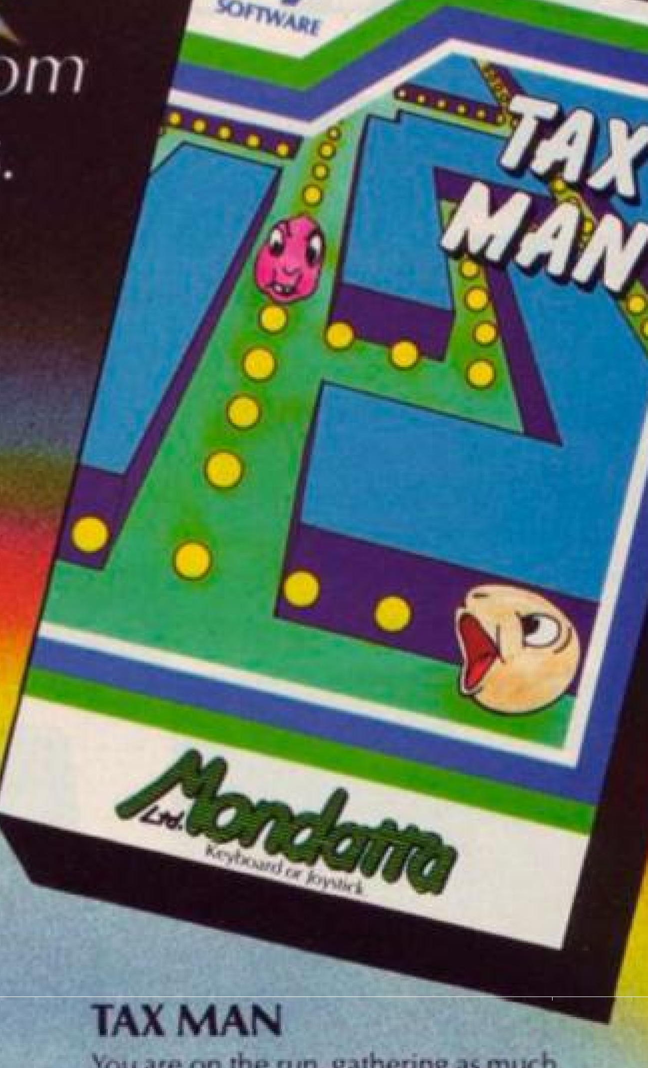
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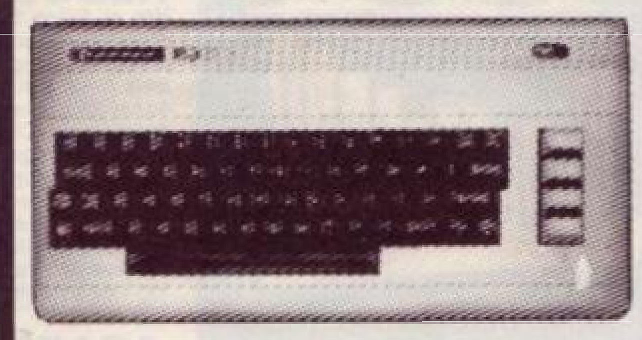
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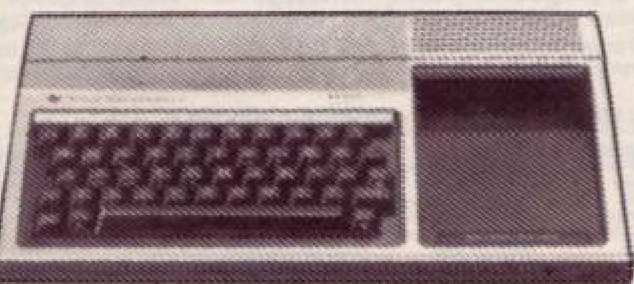


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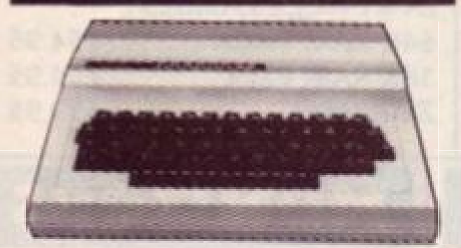
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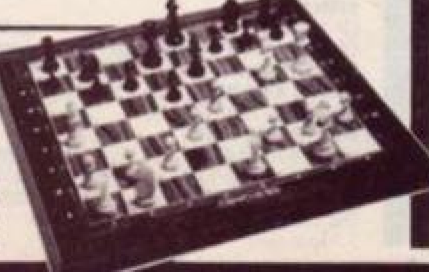
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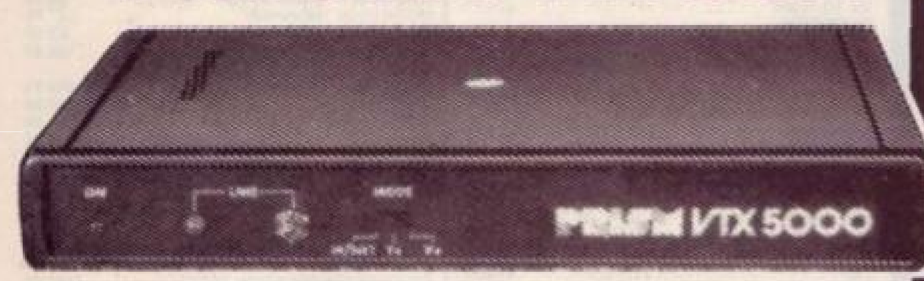
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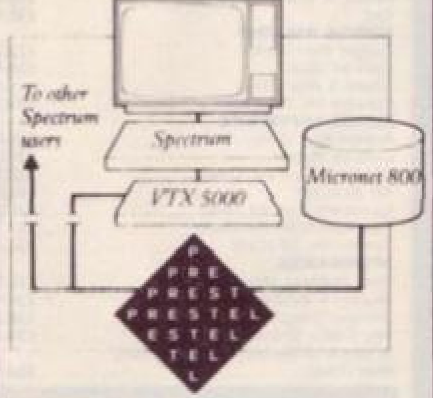
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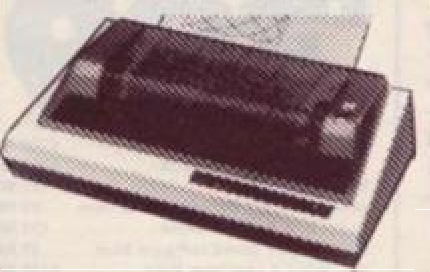
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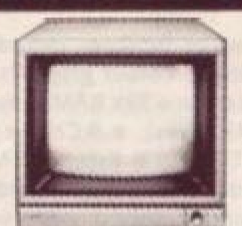
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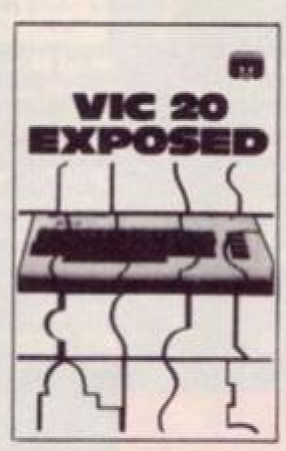
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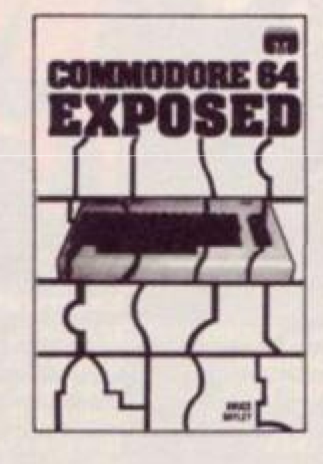
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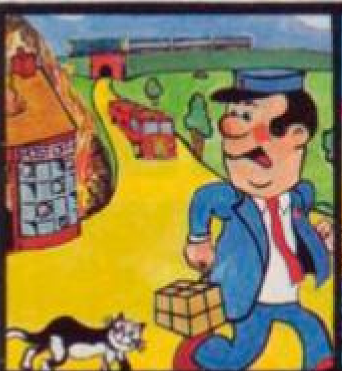
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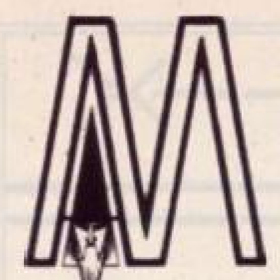
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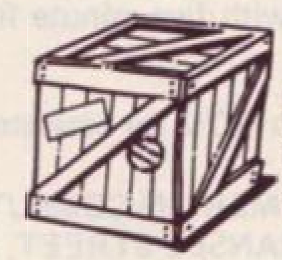
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4. NORTH AMERICAN INDIANS. This program helps to develop reading and comprehensive skills. You complete sentences using a word from the list on the screen. Correct responses are rewarded by the creation of an Indian scene which includes tipis and buffalo.

You may replace the questions in this program with your own (create a bank of up to 250 questions with a 48K Spectrum). Any subject area may be chosen.

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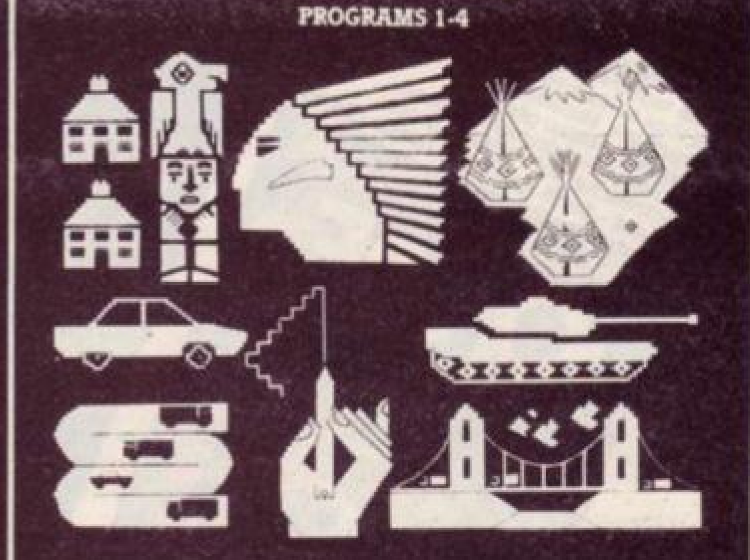
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5. MULTIPLICATION TABLES. This program with correction sequences enables you to test individual multiplication tables, or all tables up to a maximum that you choose. Carriages are added to a train as the score increases – see the train glide through the countryside when the test is finished.

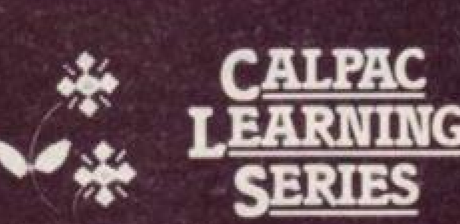
6. THE ROMANS. Answer questions on the Romans to win a horse, chariot, viaduct and temple. Answer enough correctly and the horse will gallop away with its chariot.

7. SPELLING TESTER. The words in the test are initially displayed on the screen. Then short sentences are used as prompts for the words, which must by typed correctly to add stages to a space-ship.

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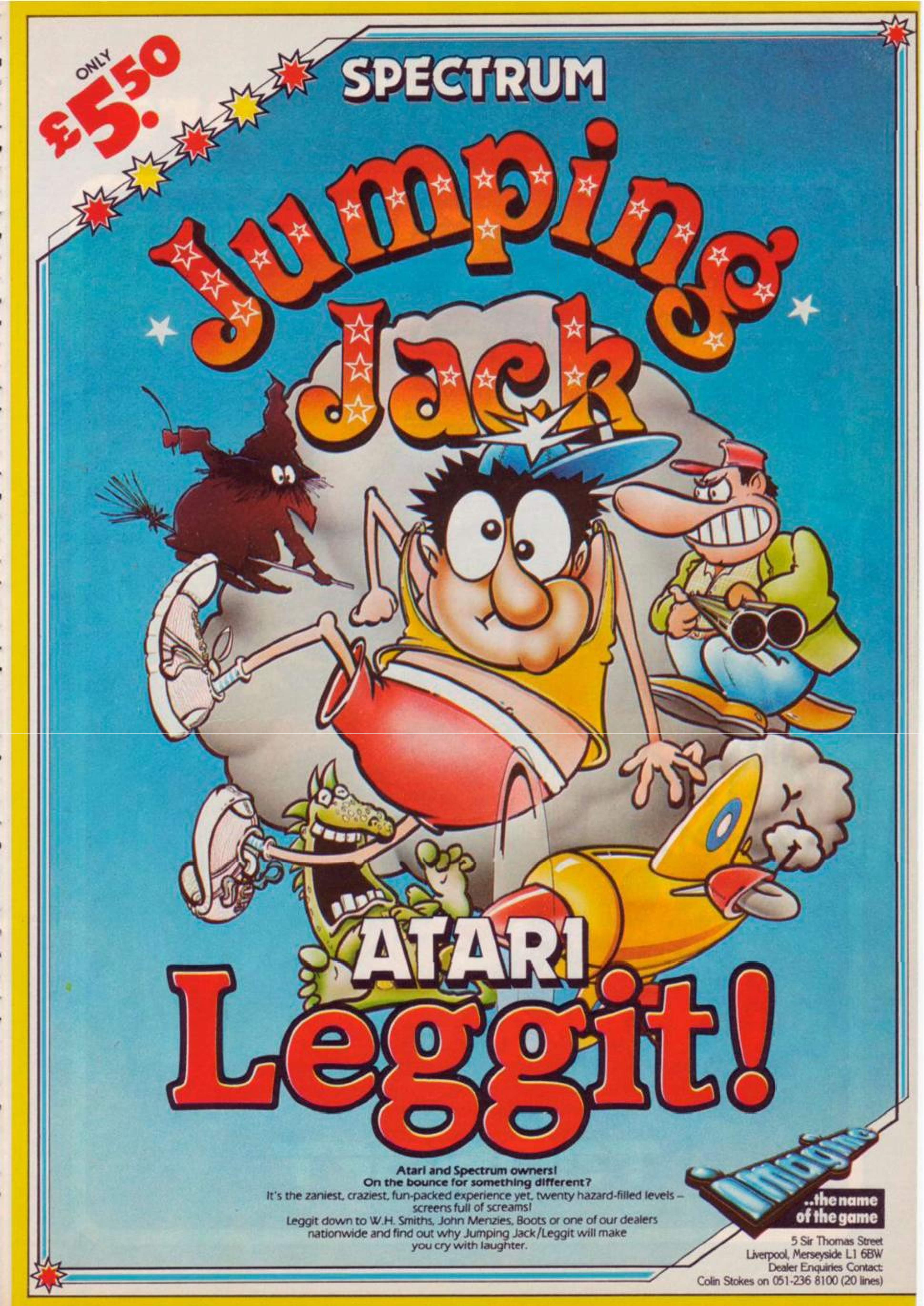
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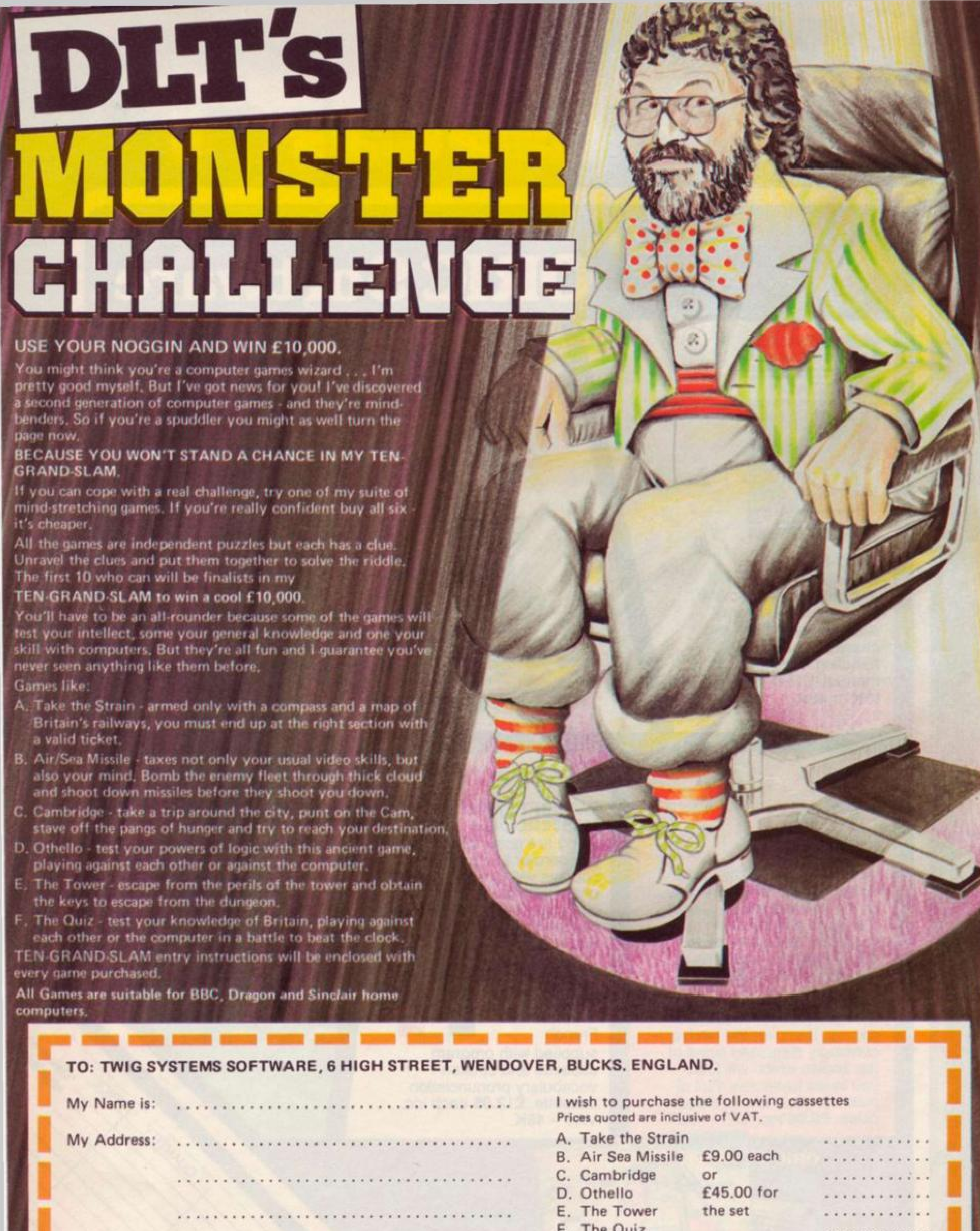

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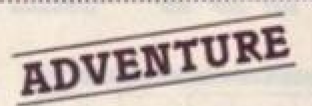
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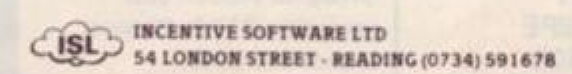
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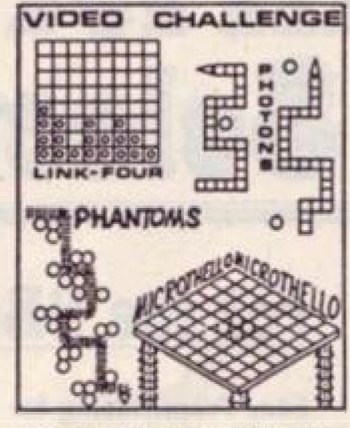


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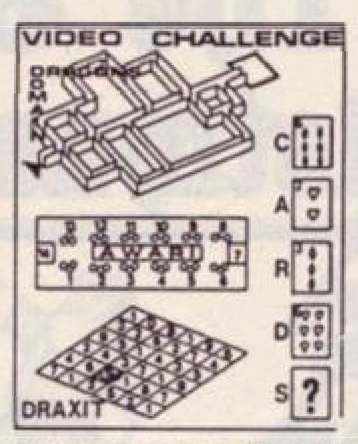
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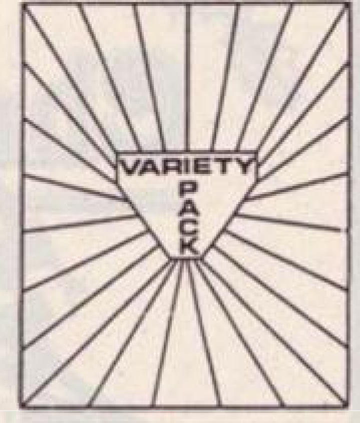
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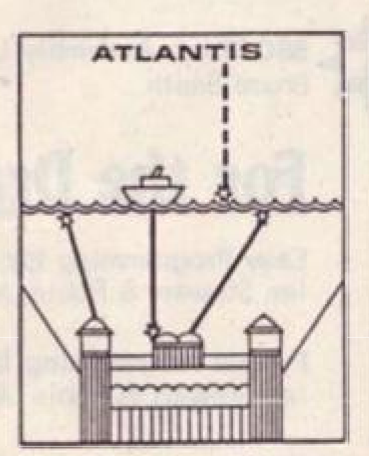
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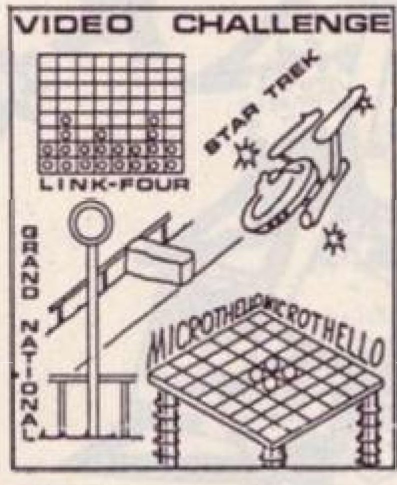
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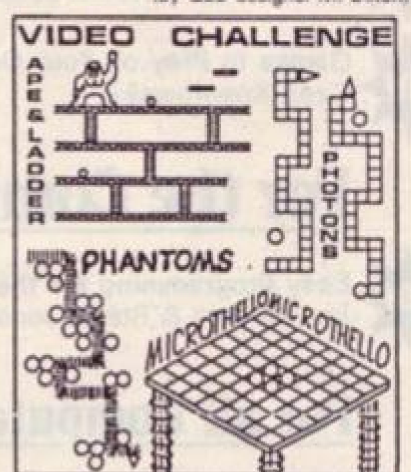
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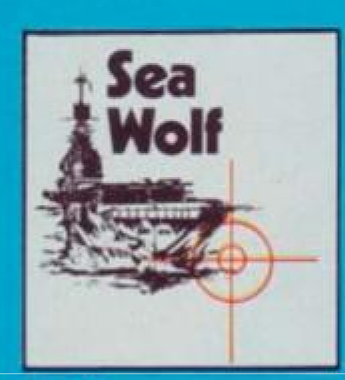
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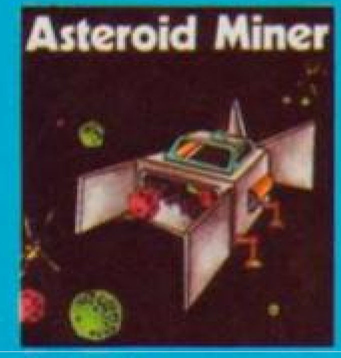
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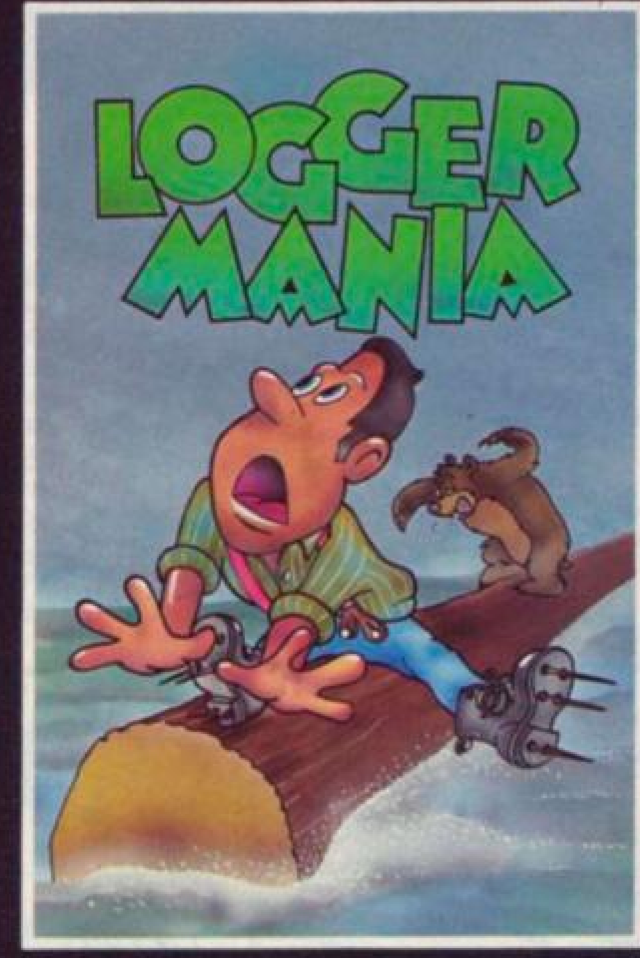
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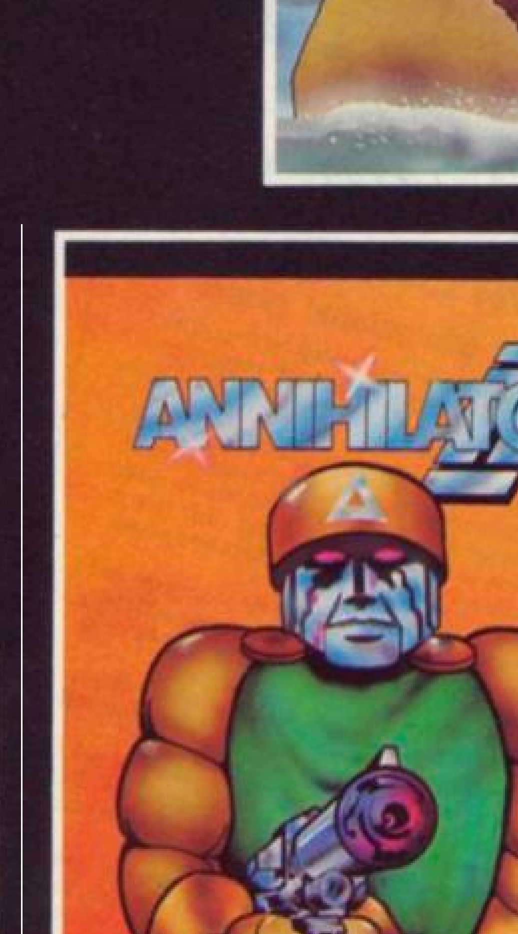
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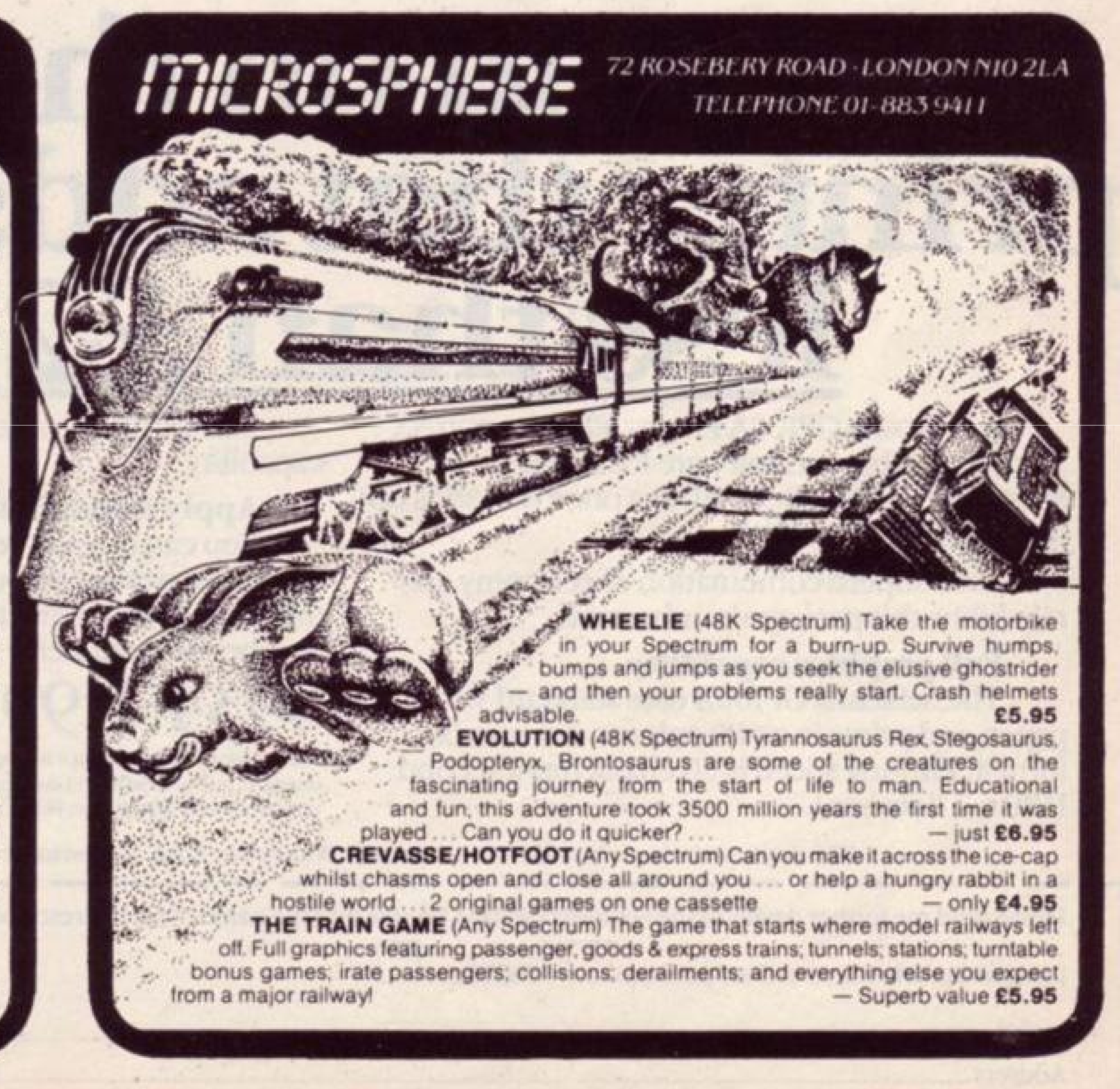
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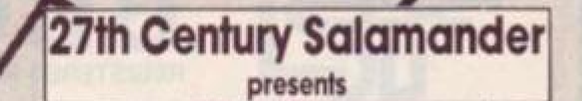
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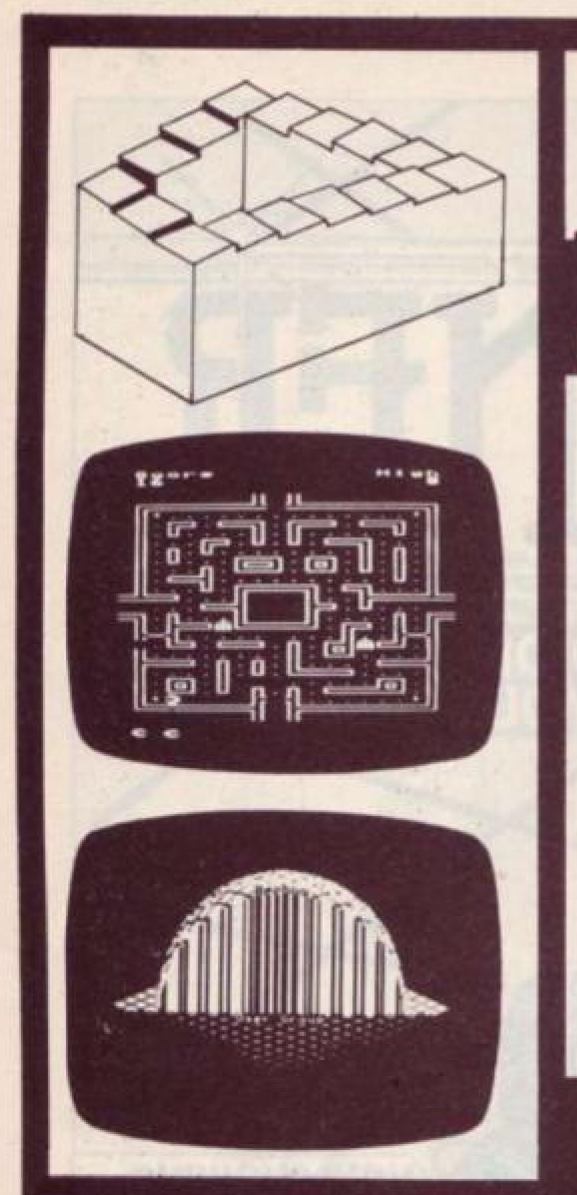
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August/September Issue — GAMES — Space Lords (32K) a two-player space battle, and Mars Lander (16K). Build Yourself a Light Pen — simple explanation for the beginner, together with a sample program. Use our "Contact Points for the Beeb" to discover who to contact when in need. We show how to put those 'awkward' cassette programs onto disc. Final installment of our popular 5-part series on "Using Files". REVIEWS of — MICRONET, Watfords Electronic's Disc Filing System, two EPROM programmers, and the tax advisory package "Microtax" This month's visual programs include Spider's Web, Super Large Screen Characters, Bounce and Swing. We also show how to hold two complete screen pictures at once, and switch rapidly between them in "Dual Screens on the Beeb". A Crossword, Brain Teaser and our 4th Software Competition provide a competitive edge to this month's magazine. We also have our very popular scattering of Hints and Tips.

October Issue — GAMES — **Munch-Man**, a Snapper type game with super graphics, Illusions graphics and sound you won't believe. A Versatile **Renumber** program for Basic, **Fabric Patterns**, an invisible **Alarm Clock**, **Disc Sector String Search** and a program fro drawing **3D Surfaces**. Articles on the **Teletext Mode** for beginners, **Compilers and Interpreters**, using **Joysticks**, using the **Speech Synthesizer** and more. Reviews of two **Cassette Recorders** (Marantz Superscope C190 and Acorn Data Recorder), three **Printers** (NEC pc-80238, Star DP840 and CP-80), and lots of new games software (and we've arranged **SPECIAL OFFERS** for members). Plus a review of the new **Acorn Electron** and news of our new magazine for Electron users called **ORBIT**. Plus all our usual features like Hints and Tips, Postbag, and a new Brainteaser.

STOP PRESS
BEEBUG has negotiated a deal with ACORN over the new 1.2 OPERATING SYSTEM ROM. BEEBUG members are offered the ROM at around half-price. See BEEBUG Feb. Issue for details.

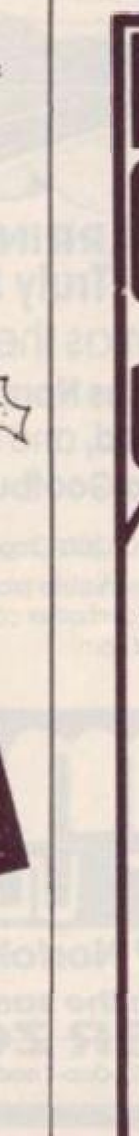
SOFTWARE DETAILS
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Magazine programs now available on cassette to members at £3.50 inc: VAt & p+p — see April/May issue for details.

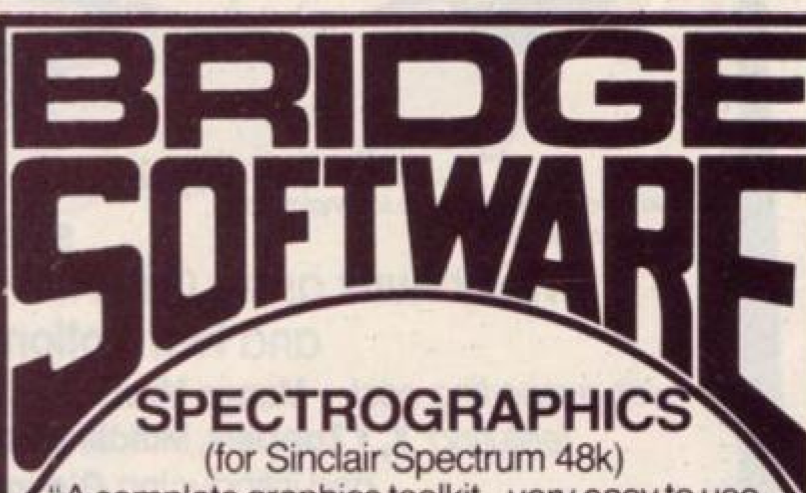
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Available for Commodore 64 **£7.50**
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MATRIX

Jeff Minter has taken Gridrunner – the game that topped bestseller charts in USA and UK – and created an awesome sequel.
Graphically superb, it features multiple screens, new aliens and attack waves, mystery bonuses, renegade humanoids, deflexor fields, diagonal tracking, countdown/panic phase and much, much more.
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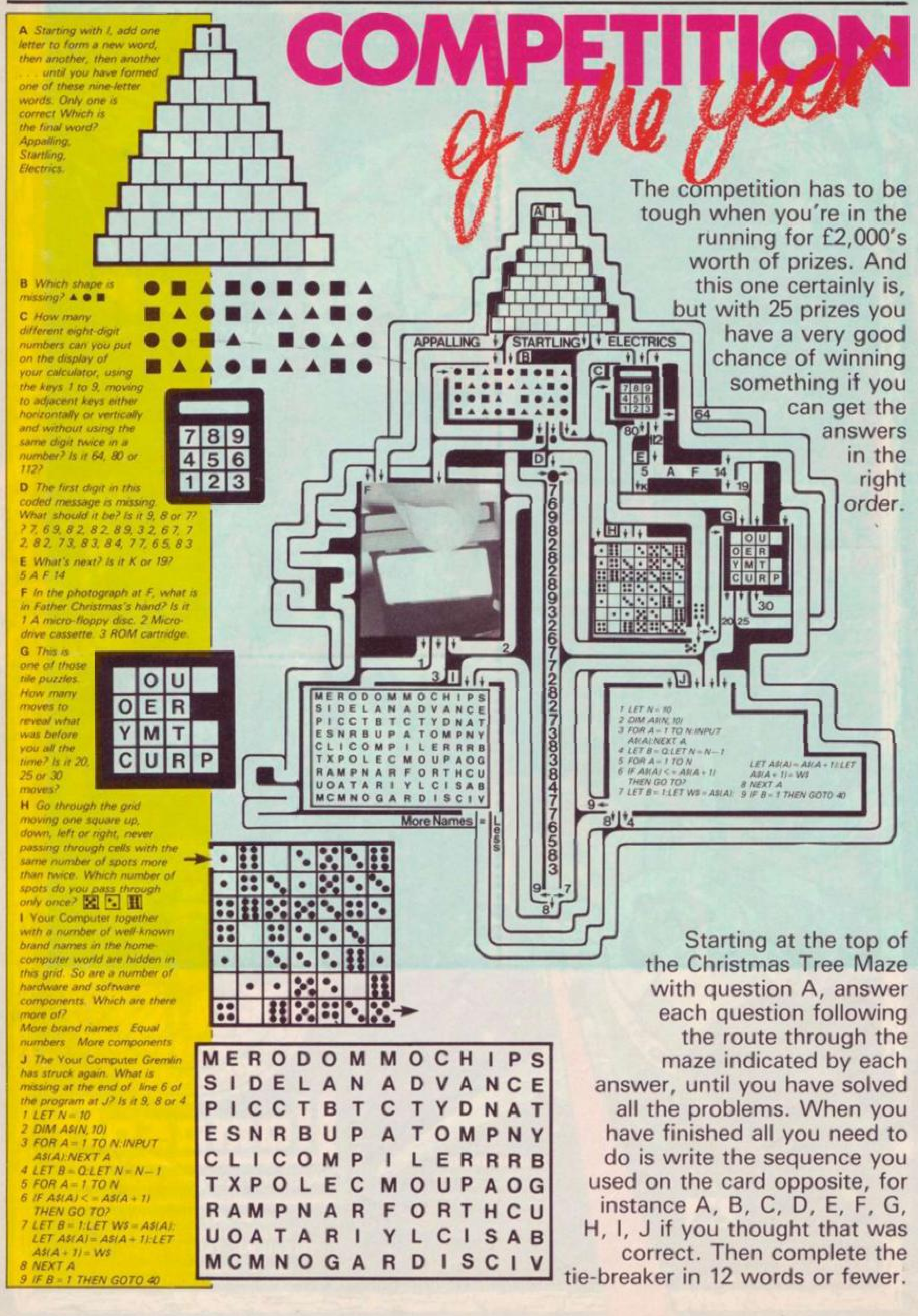
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COMPETITION of the year



A *Starting with I, add one letter to form a new word, then another, then another . . . until you have formed one of these nine-letter words. Only one is correct. Which is the final word? Appalling, Startling, Electrics.*

B *Which shape is missing?* ▲ ● ■

C *How many different eight-digit numbers can you put on the display of your calculator, using the keys 1 to 9, moving to adjacent keys either horizontally or vertically and without using the same digit twice in a number? Is it 64, 80 or 112?*

D *The first digit in this coded message is missing. What should it be? Is it 9, 8 or 7?*
? 7, 6 9, 8 2, 8 2, 8 9, 3 2, 6 7, 7 2, 8 2, 7 3, 8 3, 8 4, 7 7, 6 5, 8 3

E *What's next? Is it K or 19?*
5 A F 14

F *In the photograph at F, what is in Father Christmas's hand? Is it 1 A micro-floppy disc. 2 Microdrive cassette. 3 ROM cartridge.*

G *This is one of those tile puzzles. How many moves to reveal what was before you all the time? Is it 20, 25 or 30 moves?*

	O	U	
O	E	R	
Y	M	T	
C	U	R	P

H *Go through the grid moving one square up, down, left or right, never passing through cells with the same number of spots more than twice. Which number of spots do you pass through only once?*

I *Your Computer together with a number of well-known brand names in the home-computer world are hidden in this grid. So are a number of hardware and software components. Which are there more of?*
More brand names. Equal numbers. More components.

M	E	R	O	D	O	M	M	O	C	H	I	P	S
S	I	D	E	L	A	N	A	D	V	A	N	C	E
P	I	C	C	T	B	T	C	T	Y	D	N	A	T
E	S	N	R	B	U	P	A	T	O	M	P	N	Y
C	L	I	C	O	M	P	I	L	E	R	R	R	B
T	X	P	O	L	E	C	M	O	U	P	A	O	G
R	A	M	P	N	A	R	F	O	R	T	H	C	U
U	O	A	T	A	R	I	Y	L	C	I	S	A	B
M	C	M	N	O	G	A	R	D	I	S	C	I	V

J *The Your Computer Gremlin has struck again. What is missing at the end of line 6 of the program at J? Is it 9, 8 or 4*

```
1 LET N = 10
2 DIM A$(N, 10)
3 FOR A = 1 TO N:INPUT
  A$(A):NEXT A
4 LET B = 0:LET N = N-1
5 FOR A = 1 TO N
6 IF A$(A) <= A$(A+1)
  THEN GO TO?
7 LET B = 1:LET W$ = A$(A):
  LET A$(A) = A$(A+1):LET
  A$(A+1) = W$
8 NEXT A
9 IF B = 1 THEN GOTO 40
```

The competition has to be tough when you're in the running for £2,000's worth of prizes. And this one certainly is, but with 25 prizes you have a very good chance of winning something if you can get the answers in the right order.

Starting at the top of the Christmas Tree Maze with question A, answer each question following the route through the maze indicated by each answer, until you have solved all the problems. When you have finished all you need to do is write the sequence you used on the card opposite, for instance A, B, C, D, E, F, G, H, I, J if you thought that was correct. Then complete the tie-breaker in 12 words or fewer.

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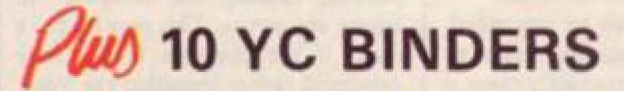


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5th 10 HAND-HELD CGL GAMES

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YOUR LETTERS

EXTRACTING THE BINARY

Here is an interesting one for all Spectrum and fake-Spectrum owners. Now, I am no wizard with electronics or computers, but I decided to build a synthesiser then produced its notes by binary code. Great eh? Well after two months of oscillators, shapers, filters, equalisers, and sample hold I finally got the thing going. Now for the easy part!

I'll write off to the nice Sinclair Research and find out what logical on's and off's come out the back of the mighty machine. Well three weeks later I was still playing synth by the boring old method of fingers instead of ins, outs etc.

Never been one to shy away from the Buzby I rang Sinclair and spent five minutes chatting to the telephonist who assured me that the technical dept did not reply by post and I had better speak to a technician. Ring back between 3 and 4 pm.



3.30pm: "Hello, I phoned earlier about some technical information."

"Oh yes! I'll just put you through." Healthy pause "Oh!"

"Good afternoon, technical department, can I help?"

"Oh yes please. Can you tell me if the binary code output from the output port is series or parallel?"

"Er. I don't really know. Have you not got any sheets or technical books on this?"

"Er. I don't really know. Is there anyone else slightly more technical there please?"

"Er. Not really were in a bit of a mess really I don't really know."

"Really. You don't know a lot do your?" "Er! not really."

"Can you connect me back to your switchboard please?"

"Hello! Switchboard here."

"Oh hello! can you give me the phone number of your head office please? Your technician doesn't seem to know a lot, maybe someone there who knows more" — delay.

"I'm sorry I don't have the phone number but this is the address. Oh by the way the letter you sent will be replied to by our technician."

Well next I rang head office and was partially helped by a nice young lady with a charming accent who, after phoning around, assured me the code went out in parallel — it's a start anyway — but she couldn't help as regards what went out of each pin connection.

Maybe you could suggest someone who would know what and how these binary get out of the back of our beloved Spectrum.

P. R. Robinson,
Nuneaton,
Warwickshire.

HARTNELL SLAM

Since its early days, your magazine has risen from poor quality to the very best, both in content and value for money. You publish more, and better, machine-code games than a certain games-only magazine which only produces poor Basic games. You cater for the game player and beginner alike, but one small alteration has yet to be made.

Many people have criticised your Response Frame for inaccuracy or being uninformed. Tim Hartnell's books contain many errors and the older books are filled with unnecessary pictures. Many times, in Response Frame he has answered questions wrongly or not even answered the question he was asked.

In the October issue he replied to Mr Hallam, "Unfortunately there is no way this — disabling the Spectrum Break key — can be done in Basic". Absolute rubbish! Having copied WH Smith's Spectrum demo while they were not looking, I discovered a method which is in fact obvious!

The method of Break proofing is as follows: As the first line of your program, have the following:

```
10 LET V1 = PEEK 23613-2:
   POKE 23613,V1.
```

Since this is sometimes restored by For . . . Next loops, Gotos and Gosubs the Poke 23613, VI may need to be repeated sometimes within the program. This can be determined by experiment. This works by dropping the error stack pointer, causing the computer to ignore any errors. This may lead to a crash if the program is not fully debugged before installing the Poke.

Also, Tim Hartnell gave a poor reply to D G Britton about tape recorders. He said that expensive tape recorders are good for high-quality Spectrum recordings. Expensive tape recorders have filters which often regard computer signals as noise and actually degrade them.

Thus, cheap recorders are best. My recorder is called a Comic, similar in appearance to Ferguson, but without pause control. It loads tapes, no matter how bad, make the most reliable recordings around and has tone control and tape counter at £19.95.

It is also available as Eurosonic or Lloytron, among other names, but all the same model. This is the best possible I have seen on the Spectrum, and better than a friend's Sony.

So much for expensive models. The examples I have given are from just one issue. Many mistakes are made in just about all issues, and it is a shame since this is the only flaw in your magazine, apart from printing many listings too small, but just readable.

In the October issue, I might add, Tim Hartnell did not answer what was asked on Vic memory by M Finch, and was even uncertain if New affected a certain Vic system variable when replying to G Ashton.

I would suggest that a panel of experts on each machine be used for replies instead. Response Frame is your main weakness.

Justin Keery,
York.

LOADED VIC

I would like to know if any other Vic-20 users have experienced any problems with using the Load command within a Basic program. My experience is that when Load is used in a program, only the first part of the next program is successfully entered into memory — using a tape recorder as the storage device.

If this problem is universal, and not some fault of my particular computer, I offer the following way around the problem:

The screen is first formatted with printed Load and Run commands, in white, on white so the user is unaware of the problem. Then the keyboard buffer is given two carriage returns — ascii 13 decimal — before terminating from program control. The effect is a valid Load and Run command automatically executed by the system software.

```
998 POKE 198,3:POKE 631,13:
    POKE 633,13:POKE 36879,25
999 PRINT"(clr home)(white)(3down)
    NEW(3down)LOAD(3down)
    LOAD(4down)RUN(3down)
    RUN(home)(blue)"
```

The instructions in brackets are cursor control functions and should be self explanatory. Load and Run must be typed twice to allow for the possibility that the Play button can be engaged or disengaged.

Archie Tuck,
Northleach,
Gloucestershire.

TV SPECTRUM

I recently bought an Amstrad colour TV and found that my Spectrum would not produce any colour on it. Having read in magazines like yours advice on how to cure the problem by lifting off the cover and having a twiddle with the potentiometers inside, I did so.

It cured the colour problem, but carefully lifting off the case had factured the keyboard ribbon cable.

I believe the ribbon cable had become brittle with age, possibly due to the excessive heat generated inside the case of the computer when used for any length of time. It is known that heat adversely affects plastics in this way even though the temperature is not great enough to melt it.

Now for the cruncher! Since I cannot hide the fact that I have had the top off my computer, I have invalidated the guarantee and so must pay Sinclair a minimum charge of £30 to have it repaired.

Please can you print a warning to all Spectrum users not to lift off the cover of their machines if they have

NO COMMODORE COMPATIBILITY

I have been following your magazine every month since I bought my Vic-20 last August. A few months later Commodore Business Machines had introduced its new mode, Commodore 64. With this improvement I am very disappointed that Commodore 64 could not run Vic-20 software because a different system had been used.

Compare other computers such as the Apple II and Apple II+ and Apple IIA; BBC Model A and Model B; Atari 400 and 800 for example. In these, software is compatible. Furthermore, Atari upgraded its 16K micro to 48K without any extra charge and the difference in price between a 16K and 48K Spectrum is small. How about Vic-20 to Commodore 64?

Another problem I would like to point out is that of method of payment for buyers outside the U.K. — whether Postal Orders or Bank cheques are acceptable. I could get software from my local authorised dealer, but it would take weeks or months to get the latest software shown in your advertisements.

Educational software seems thin on the ground. Why? It would be nice, for example, if Commodore could introduce engineering-language software.

Abdul Jabbar BS, Singapore.

had them for some time. On a brighter note though, I have been into WH Smith's and bought an issue 3 Spectrum which gives excellent colour on my Amstrad TV and still works well with all my extensive existing software with the one exception of DK'Tronics Light Pen.

Incidentally, this was typed on the new Brother EP-22 typwriter/pritner which takes full A4 size paper, works off four torch batteries, can use plain paper or thermal paper, has its own RS-232C interface and at £170 inc. VAT must be one of the best buys around.

M D O'Dea,
Lewisham,
London.

PLAY THE GAME

Having bought a 48K Spectrum it took only a week to realise I was not interested in games. I did want to use the computer in my business though. Sinclair's Small Business Accounts seemed the answer. It took five weeks to arrive and seemed just what I needed but within hours it failed and was returned.

After fruitless letters over another four weeks Sinclair offered me my money back — still not received at time of writing. Is there no-one that offers the small business man a program that makes the Spectrum worth owning?

G. J. Abrahams,
Birchington,
Kent.

There are several blunders to be corrected in the November issue. The first and most grievous one is that two bytes are missing at the end of each line in the Oric Invaders hex dump. Our apologies to those who have found this out the hard way. Send us your address and we will send you a copy of the correct listing.

The hex loader for the Scram-81 program works perfectly if you start off by typing GOTO 7000. You might however like to add line 50 which reads GOTO 7000.

I Brown's program Maze, in Software File is wrongly billed for the Dragon. It runs instead on the Spectrum.

The listing for Andrew Caple's Capman program in the October issue is correct. A number of people, however, have complained that when they run the program it stops with an error message at line 40. Almost certainly this indicates that they have made a mistake in keying in the Data statements in lines 110 to 242.

Line 40 reads in the Data: if it finds that the Data statement is one character too short or too long, or contains a letter outside the range A to F it will throw the message "nonsense in Basic" or "variable not found".

At this point type in directly from the keyboard, PRINT A$. This will allow you to track down the faulty Data statement. A$ should contain the string of hex numbers which is found between the quotation marks in each of the Data statements.

WHILE YOU ENJOYED an Indian summer of computer price cuts, manufacturers were already preparing for a bleak winter. They knew that some of their number would not make it to the shelter of the Christmas consumer spending spree.

With low micro prices paring profit margins down to a lean minimum — and beyond — it seems inevitable in retrospect that there would be casualties. A few companies have gone out of business altogether; others have decided to pull out of home computing before their losses become intolerable.

The move by one of the oldest names in the market, Texas Instrument, to abandon its home-computer operation came just two weeks after the U.S. toy manufacturer Mattel's decision to hand over distribution of the Aquarius to the builder of the micro, Radofin. That ends both companies' involvement in the production of fully-fledged home computers.

Atari, the company that offered Texas such stiff competition on both sides of the Atlantic, has also been bloodied by heavy losses. It was $180 million in the red on the last three months' trading.

Hopes of a return to better fortunes are pinned on Atari's new XL series — the first new machines from the company for four years.

In a market where there is major price warfare, you have to be big to sustain losses, and ideally have the support of a wide product range. Atari, Texas and Mattel are large concerns with considerable financial muscle. But two British producers, Dragon Data and Oric Products, have both been obliged recently to look outside for new investment to help them over liquidity problems. Incidentally, Dragon's founder Mettoy, which had gradually sold off all but a 15.5 percent stake in the computer company, recently went into receivership.

Dragon created most of its large user base by having machines available in volume for last year's Yuletide rush. It could only pull off a similar coup this year if Electrons, CBM-64s and Atari 600XLs are not around in sufficient numbers to satisfy demand.

Computer companies that fell by the wayside are Grundy Business Systems — the NewBrain's manufacturer — and now Jupiter Cantab which created the first and only Forth-based home micro. Even a price-cutter in the business portable market, Osborne Computer, has had to seek protection from its creditors under the U.S. Bankruptcy Code's section 11.

But how is it possible for a market as ostensibly booming as home computing to harbour so many financial problems? It is exactly because of the rapid expansion that firms have great difficulties in estimating growth accurately, and planning for it accordingly.

An apparently minor miscalculation at the bottom of an exponential growth curve can lead to a financially crippling error at the top. Add to that problem a savage campaign of price cuts and few companies can count themselves safe. The moment of truth will come for more manufacturers when we reach the 1984 side of Christmas. Until then, computer enthusiasts may sympathise with the plight of the companies, but they will be drinking festive toasts with the money the price war has saved them.

How to write for *Your Computer*

We called this magazine *Your Computer* precisely because we welcome your views, tips and hints and even your criticism of machines and software in general. If you would like to see your name in print, whether on a Software File program or a full-blooded article, here is how to go about it. Ideally, all articles should be typed double-spaced on one side only of uniform sheets of paper. If listings can be dumped directly from a printer — you can always use a friend's or user group's — this minimises the risk of error. In a perfect world a cassette would accompany the article. That considerably speeds up the checking process. Not only do you get to air your own discoveries and opinions, but we will even pay you for the privilege. We pay £35 per published page — that's as it appears in the magazine and includes illustrations.

Why not give it a try? You have nothing to lose but your postage.

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How the Electron will grow: expansion boxes

WITHOUT DETRACTING from the many positive features of Acorn's new baby, it does lack the RS-423, user and printer ports of its big brother, the BBC Micro. While it is no secret that the Electron features a built-in connector for the addition of hardware expansion units, the first picture of such a unit is reproduced here — it is important to emphasise that this is just a prototype.

Each hardware expansion unit will have a certain number of functions built in, to allow users to customise their Electron for particular purposes. Definitely on the drawing board is a box containing not just a disc interface, but a complete disc and drive units as well. Acorn favours a proper 3 to 3.5 inch diameter disc, but is still deciding among companies like Sony, Winchester, Hitachi and others. It will plump for a manufacturer whose product is likely to become an industry standard. It is not clear if one of the expansion boxes will contain the 'missing' RS-423, printer and user interfaces of the BBC Micro, although a box containing an A/D converter, RS-423 and interface for ROM cartridges was one of the possible configurations under consideration.

The cartridge sticking out of the box in the photograph contains two 16K ROMs which would be able to provide the Electron with, for instance, View — the BBC's word processor, or programming languages like BCPL or perhaps Forth. Another feature not present on the Electron is the BBC's Mode 7 Teletext. This, together with the lack of an RS-423 hinders networking. Nevertheless, a box could be produced which would add these features.

It was recently claimed that 20,000 Electrons had been ordered by British Telecom for a new medical network accessed through Prestel called the Chain. This network enables doctors and nurses to get through administrative drudgery quickly on-screen, with the central computer at the hospital providing prompts. In fact, it seems unlikely that the order is for an Electron *per se*, or even for an Electron plus a magic box, but rather for a dedicated terminal using Electron components. Nevertheless, this indicates that the potential is there.

The potential is also there for the Tube — although, of course, we have yet to see it officially for the BBC itself, let alone the Electron.

However, Acorn has successfully used Z-80s and 6502s as second processors with the Electron, so it looks like the Tube will be in a box.

Things are still very much at the prototype stage for the expansion box; for certain applications it looks as though an intermediate expansion box may be necessary to obviate power feedback problems — the intermediate box would have to supplant the Electron's own power supply as well as powering the new peripheral.



An Electron with a difference.

Companies may come and go but the microcomputer show goes on

EXIT TEXAS Instruments, Mattel and Jupiter Cantab stage left; enter IBM from wings stage right. The home-computing story-line is now incredibly complicated; the only thing stopping it from being a farce is that it is not funny.

With Texas Instruments' decision to pull out of the home-computer market, new machines like the TI-99/8 are being written out of the script before they have even put in an appearance.

Giant toy-maker Mattel has also concluded that now is the time to stop selling computer hardware, and early in 1984 it will be handing over distribution of the £50 Aquarius to Radofin Electronics U.K., the machine's manufacturer.

The £90 Ace, the only Forth-based home micro, is now out of production. A meeting of creditors of the Ace's manufacturer, Jupiter Cantab, has been called.

But the long-expected twist to the plot is that IBM has launched itself into the home-computer free-for-all with the £500-plus PCjr. With that sort of price, Big Blue is clearly going for the more stable end of the market.

Texas — in 1979 the first company to produce a home colour micro, the TI-99/4 — has decided to call it a day after sustaining major losses in its home computer operation. According to a Texas spokesman the firm was "loosing money hand over fist in the home-computer market" — a fact which accounts for almost all of Texas' $230 million losses in the last six months.

The chip-making side of Texas' business is "going ahead strongly", and the company has no current plans to withdraw its popular Speak and Spell range of learning toys. Warranties on Texas hardware will be honoured.

Even though TI-99/4A production is ceasing, there should be no shortage of programs for the moment. The Texas spokesman says that there are "large inventories of software, and a certain amount of new stuff still in the pipeline".

Big Blue's little baby

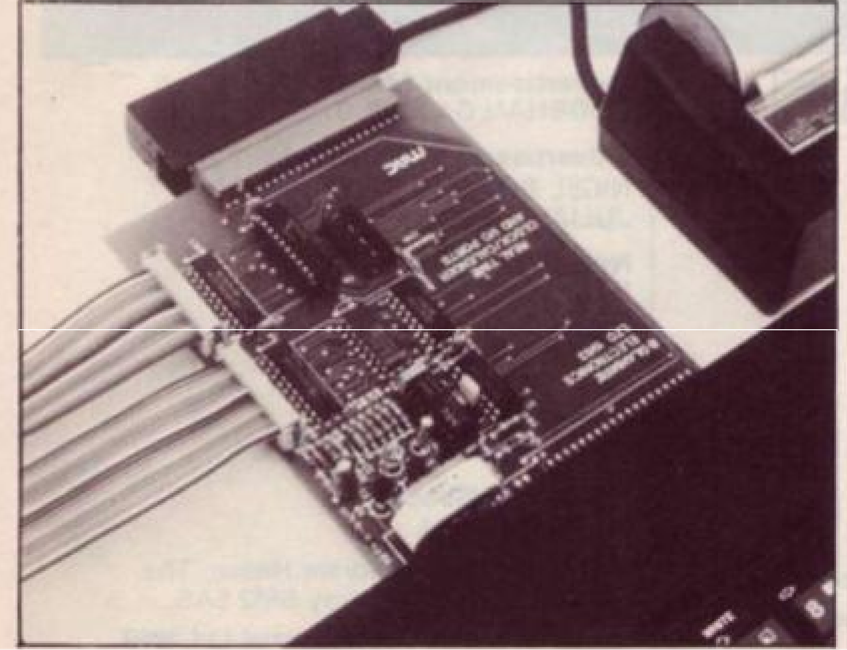
FLUSHED WITH its success in the personal computer market, IBM has decided to make its presence felt in the home. The U.S. giant broke the shell of secrecy surrounding its home-computer project to reveal not the Peanut, but the PCjr.

Apart from the novelty of the PCjr's cordless keyboard which uses an infra-red signal to communicate with the separate 8088-based, 16-bit computer from up to 20ft. away, this colour micro holds few surprises.

It comes in two versions: a $669 64K for the basic unit, or $1,269 for 128K and diskette drive — hardly the sort of prices that will put it in the mainstream of British home computing.

In any case IBM has no plans to bring the PCjr out in the U.K. yet, but when it does you can expect the cheaper version to sell for between £500 and £600.

This real-time clock/calendar with I/O ports has eight programmable inputs and eight programmable outputs. The battery-powered clock provides the computer with month, day, date, hours, minutes and seconds. So you could, for example use your Sinclair as an electronic diary; the clock would keep time while the ZX-81 or Spectrum was switched off. The clocks are manufactured by Glanmire Electronics. Telephone Cork 889209.



Video teach-ins for serious programmers and games freaks

If Gutenberg had spread the word about printing by sending out hand written notes it would have taken the world a long time to find out about its advantages. So the argument goes you should not write books about computing but instead harness the television screen to teach people. Ideally you could put the lessons on a ROM cartridge but present ROMs do not carry enough memory. Both PolyGram and WH Smiths have done the next best thing by bringing out videos. Smiths has produced an own brand video — its first-ever — which is probably also the first Spectrum tuition video.

Called *Introduction to Programming*, the course presented by David Redclift comes in two parts costing £16.95 each. Level One teaches Basic programming, and contains four programs which can be downloaded from the video via an audio tape recorder into your Sinclair ZX Spectrum. More advanced programming is the topic of the Level Two tape. This tells you about string slicing, array handling and animation. Two programs are included for transference into your computer.

The videos will be on sale at 250 Smiths branches in the U.K. On a less eductional note, PolyGram Video has produced a trilogy entitled *How to Beat Home Video Games*. Presented by ace games player Philip Wiswell, games from stables as diverse as Parker Brothers, Apollo, Imagic, Activision and Atari are presented. As the techniques are explained, the game plays are shown.

The three cassettes cover different games for different systems. The first volume — entitled the Best Games illustrates classics like Frogger, Asteroids, Space Invaders, and Chopper Command. volume two deals with more recent games to appear, like ET.

The third volume is more hardware-oriented, dealing with new video games systems — the Vectrex, Colecovision and the Atari 5200 but it also shows 20 games.

Wiswell has endorsed the video approach not because he feels that his potential audience cannot read, but because it is difficult to visualise from the written word what he is trying to say: "When you see it happen on tape, it is no longer theory."

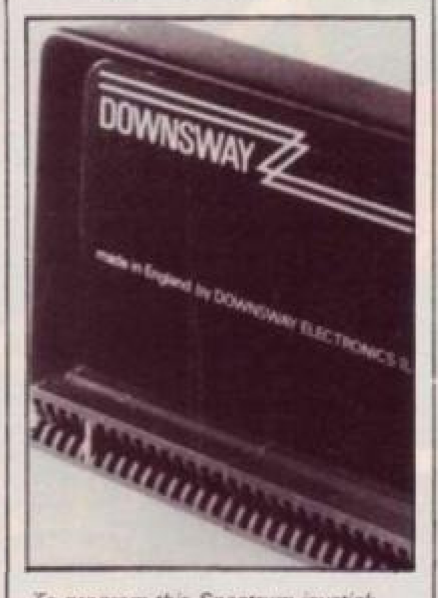
Floppy cuts on the horizon

Next year you can expect to see floppy disc drives widely available in high street chains and at dramatically lower prices. One major source of disc drives, Taiwan, hopes to push its export price below $100. By the time they reach the shops here the drives could be selling for as low as £100.

WH Smiths already stocks 5¼ inch Cumana drives and 3 inch Hitachi drives for the BBC micro in 30 of its 250 branches. In these stores the normal computer departments have been expanded into "shops within shops".

Both drives have been packaged to allow the user to "plug in and go". They come complete with cables, a manual and a formatting disc. A single 100K unit from Cumana costs £250 while a 3 inch Hitachi drive with the same capacity costs £225.

For £329 Cumana also sells a disc system for the Dragon although this will not be available at WH Smiths.



To program this Spectrum joystick interface, just press the key to go left, for example and move the joystick left. Any key specified by the games software can be "learned" by the interface — eight directions plus fire. The £22.95 Downsway interface is compatible with switch-type joysticks such as the Atari, Competition-Pro, Starfighter, Wico etc. Telephone Epsom 27222.

YOUR COMPUTER TOP 20

Game	Company	Machine
■Android Attack	Computer Concepts	BBC
■Arcadia	Imagine	Vic-20
■Attack of the Mutant Camels	Llamasoft	CBM 64
■Crazy Copter	English Software	Atari
■Crazy Kong	Interceptor	Vic-20
■Damper Glooper	Quicksilva	ZX-81
■Flight Simulator	Sinclair	Spectrum
■Flight Simulator	Sinclair	ZX-81
■Gridrunner	Llamasoft	Vic-20
■Jet Pac	Ultimate	Spectrum
■Manic Miner	Bug Byte	Spectrum
Night Flight	Salamander	Dragon
■Pool	Bug Byte	Spectrum
■Ring of Darkness	Wintersoft	Dragon
■Snooker	Acornsoft	BBC
■Space Raiders	Sinclair	ZX-81
■3D Grand Prix	DK'tronics	ZX-81
■Ultra	PSS	Atari
■Zaxxon	Datasoft	Atari
■Zzoom	Imagine	Spectrum

Kiss with confidence, thanks to your micro

Love is the wisdom of the fool and the folly of the wise, they say. Foolish or wise, two new programs from Acornsoft deal with love's young dream.

The Dating Game, developed by Dr Glenn Wilson of the University of London's Institute of Psychiatry, comes in four units. The first, the Dating Game itself, enables you to enter data on up to 40 people and see who is compatible with whom. It is based on the same attitudinal testing used by big computer dating agencies.

The second section, Love Style, asks you incredibly personal questions to find out what sort of lover you are: fanciful or practical, serious or playful, cool or passionate.

The third segment, Relationship, figures out whether you are a giver or a taker, committed or free, 'boss' or slave, quiet or exciting.

The final section, Dating Skills, is lightheartedly aimed at discovering if you are approaching the object of your affections in the best possible way, or if you are just plain boorish and socially incompetent.

The other program, I Do, is based on the controversial Dr Eysenck's book *Your Guide to a Happy Marriage*. This is a bit more serious and is aimed at married couples with an eye to use by marriage guidance counsellors. It has sub-sections dealing with social attitudes, personality, marital satisfaction, feminism and anti-feminism, masculinity and femininity and sexual attitudes. Apparently marital breakdown costs the country around £1 million per year, so this is your chance to help with the national debt.

Hinged pop-up screen on Olivetti's new portable



Olivetti's M-10 portable computer.

Olivetti's new portable computer, the M-10 is clearly intended to compete with the Epson HX-20. Like the Epson it is small enough to fit into a briefcase with a base area roughly the size of an A4 sheet of paper but provides a full-size Qwerty keyboard. Its distinctive feature is a hinged pop-up screen which offers eight lines of 40 characters or graphics in a liquid crystal display.

At a price which is expected to be between £400 and £500 it will appeal mainly to business users.

The M-10 comes with 32K RAM and 32K ROM. As well as the Basic interpreter the ROM contains a text editor, a terminal emulator, an address book and diary. The machine's interfaces include parallel and serial ports, a cassette port and a socket for a bar code reader. Olivetti is planning to support the M-10 with a battery-operated four-colour printer/plotter and an acoustic coupler.

CHESS PROGRAMS out of this world

NEW

ANOTHER GREAT CHESS GAME FOR THE 48K SPECTRUM

Spectrum Chess II

48K Spectrum Chess II £9.95
Two years of research and development have produced the strongest chess game yet, with 999 levels of play.

48K Spectrum Voice Chess £8.95
This incredible program talks you through your game. It tells you its move, recommends a move and contains a range of facetious comments. The game is based on the highly acclaimed ZX Chess II.

1K ZX Chess ZX81 £2.95
A fantastic 1K chess game ideal for someone who wants a quick game without waiting for loading.

Non-speaking version. Spectrum Chess £8.45

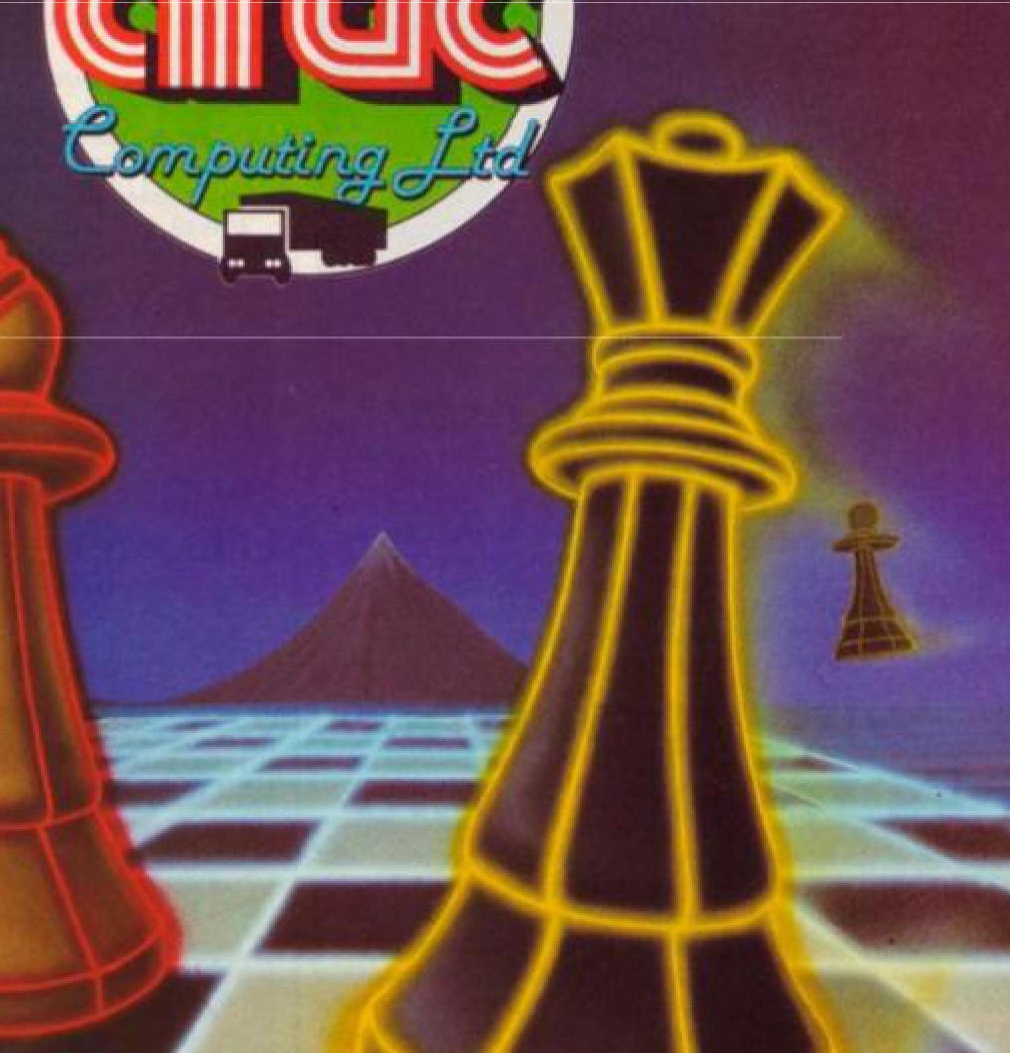
NEW

16K/48K Spectrum Chess Tutor £6.95
Not only an excellent companion but also teaches the absolute beginner how to play chess.

ZX Chess II £9.95
A great game of chess for your 16K ZX81 or 48K Spectrum. Seven levels of play. Analysis and recommended move options.

ZX Chess I £6.50
Very popular machine code program, with six levels of play and analysis option.

artic Computing Ltd



WARNING: These programs are sold according to ARTIC COMPUTING LTD's terms of trade and conditions of sale. Copies of which are availabe on request.

Artic Computing Ltd,
Main Street, Brandesburton,
Driffield YO25 8RG

Cheques and P.O.'s made payable to Artic Computing Ltd. Dealer enquiries welcome. Please state whether your order is for ZX81 or SPECTRUM. Access and Barclaycard welcome.

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Please supply ______

*Cheque for total amount enclosed £ ______

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*Please delete or complete as applicable.
Please allow 28 days for delivery.

CHRISTMAS FAIR

Preview

YOUR COMPUTER Christmas Fair

Your Computer readers will be able to use the voucher in this issue to enter the Fair for 50p less than usual. There are also special offer all-in travel and admission tickets from British Rail which can save you money. Full price admission is £2.50 for adults and £1.50 for children under 16 and pensioners.

Special exhibition fares including rail travel to London and admission to the Fair starts at £4.50 for adults, £2.50 for children from anywhere in Greater London up to £13.50/£7.00 from Birmingham. These prices do not include tube travel to Wembley.

The easiest way to get to the Fair by underground is by Metropolitan line or Jubilee to Wembley Park or Bakerloo to Wembley Central. British Rail's Broad Street line also runs to Wembly Central and the 83, 92, 182, 18, 297, 245 and 734 Green Line buses all go near the Wembley Conference Centre.

By car, follow signs for Wembley stadium and then the Conference Centre where you will find a 5,000 space car park. The Fair opens each day at 10.00am and closes at 6.00pm except Friday when there will be late night opening till 8.00pm.

■ If you want to avoid the queue and buy your tickets before the big day, you can order them from Your Computer Christmas Fair Advance Tickets, Reed Exhibitions, Throwley Way, Sutton, Surrey SM1 4QQ, telephone 01-643 8040. Tickets cost £2.50 for adults and £1.50 for children. Special party rates are available on request. Remember that applications for the Super-Saver tickets must be in no later than December 5.

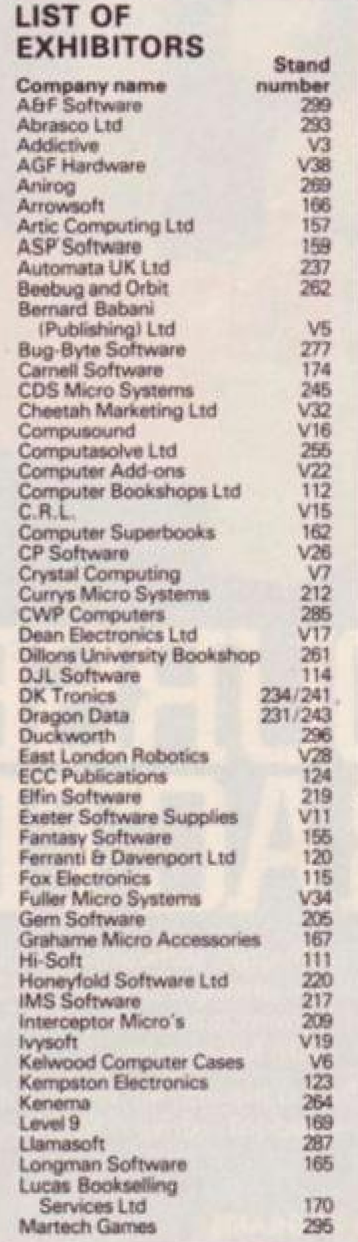


Gifts galore

Lucky Numbers will be the name of the game at our Christmas Fair. The Fair which runs from Thursday, December 15 to Sunday, December 18 is your last chance to see the pick of the year's software releases, with all the latest computers and add-ons, before Christmas. A different number will be printed on each catalogue sold and lucky numbers will be drawn every hour on the hour during the afternoon session of the Fair. The winners will receive gifts of software and add-ons — pocket calculators, Spectrum sound booster, mugs, tee-shirts and 1984 diaries.

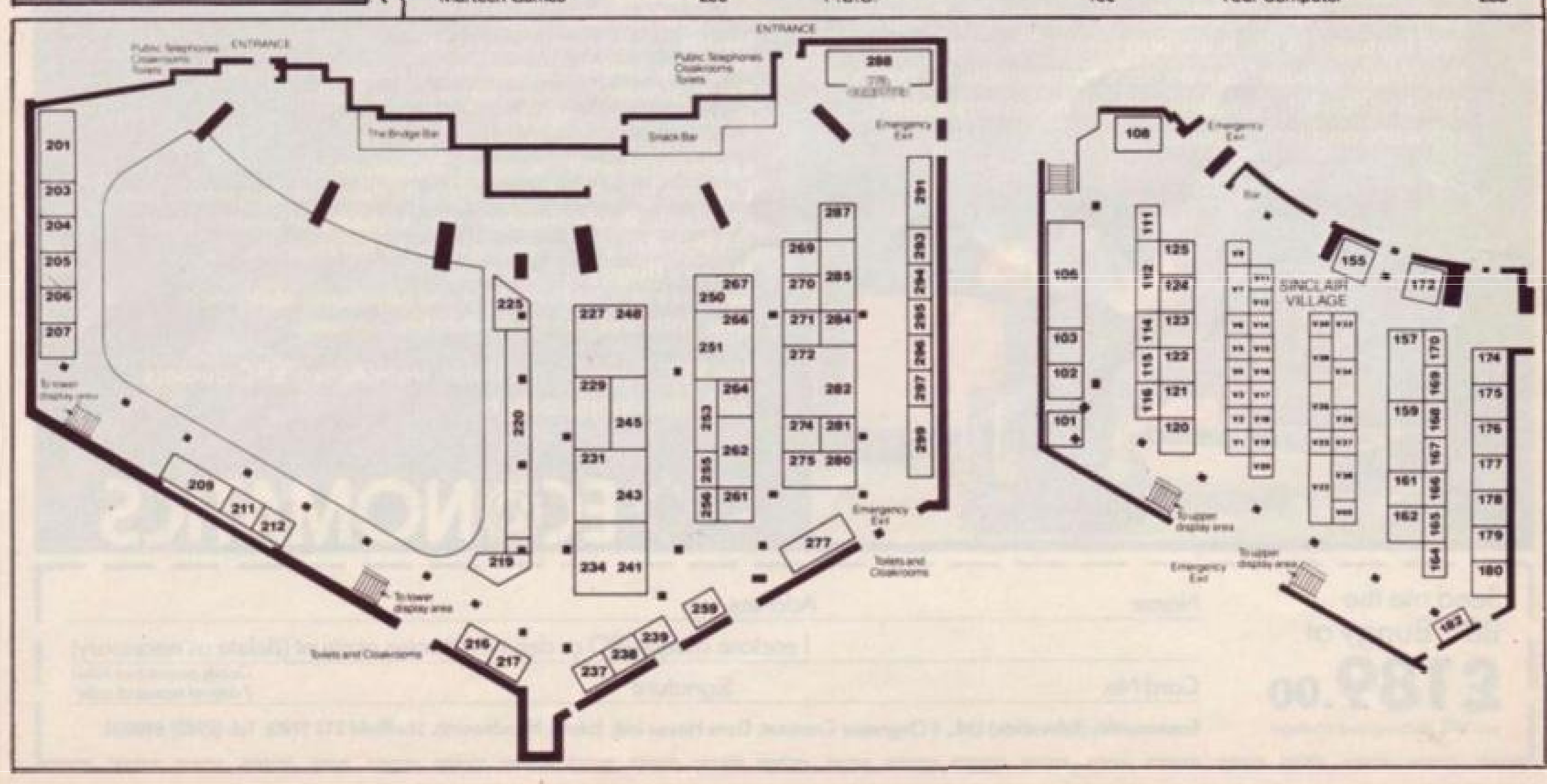
Lots of choice

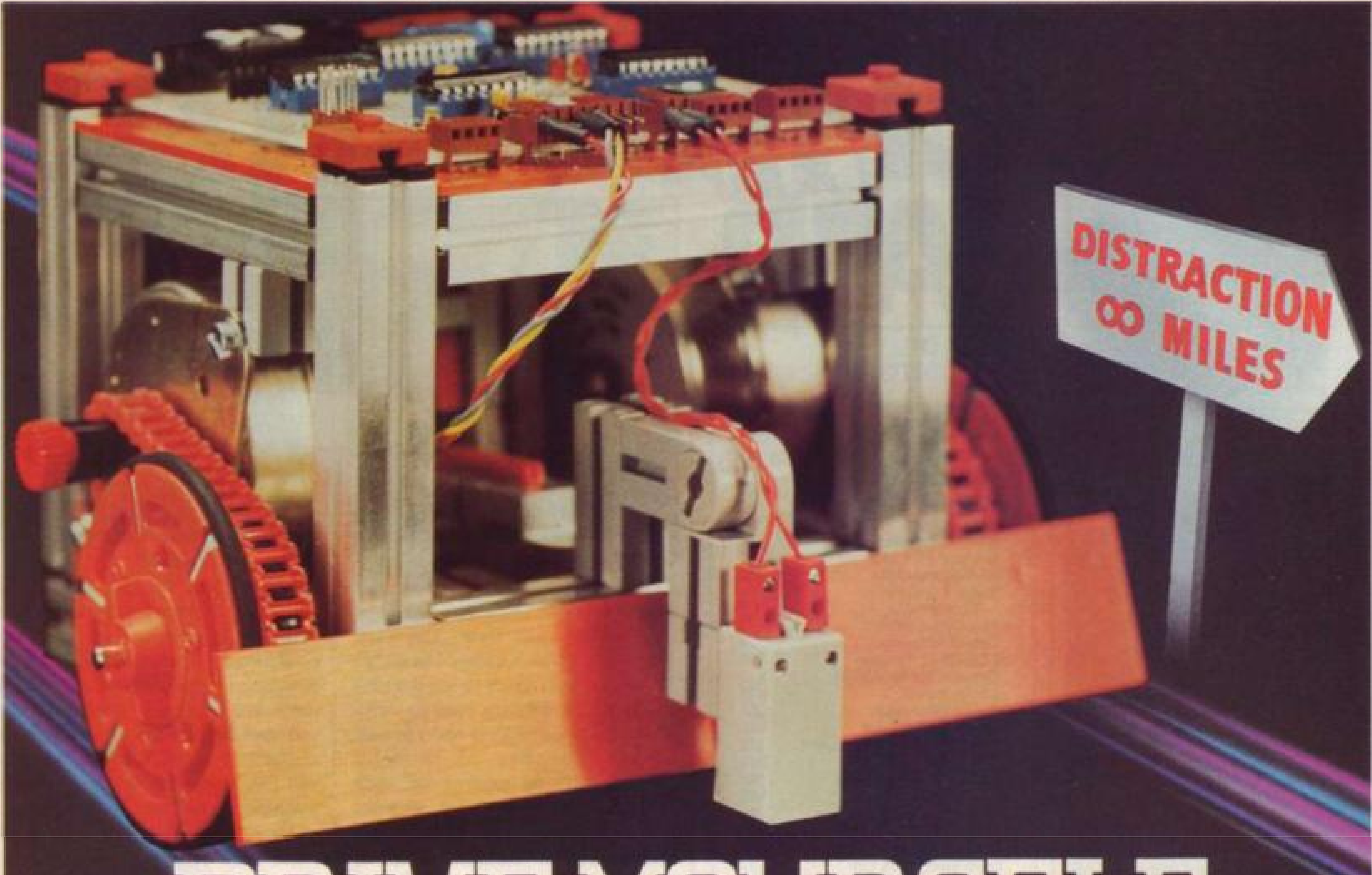
Be spoilt for choice. That's the slogan of the first Computer Fair designed to appeal just to *Your Computer* readers. With 100 companies exhibiting everything for the home computer from joysticks and track balls to speech synthesisers and printers the Christmas Fair just will not have room for business machines. You can buy and try a wider range of peripherals for your micro than you could ever hope to see in one store. You can see all the rival games for your computer up and running on screen before you choose what you want to buy for Christmas.



LIST OF EXHIBITORS

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Cheetah Marketing Ltd	V32
Compusound	V16
Computasolve Ltd	255
Computer Add-ons	V22
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C.R.L.	V15
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Crystal Computing	V7
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DRIVE YOURSELF TO DISTRACTION

WITH A *BBC* BUGGY

Trying to determine the limitations of the BBC Buggy is a task which will drive you to distraction. So sit back and accept the fact that your BBC Micro computer (Model B) controlled Robot will provide you with hours and hours of stimulating entertainment.

This rugged little vehicle which has been designed in conjunction with the BBC Computer Literary Programme and featured in the television series 'Making the most of the Micro' is built from an easy to assemble fischertechnik construction kit, complete with all necessary cables, software and instructions.

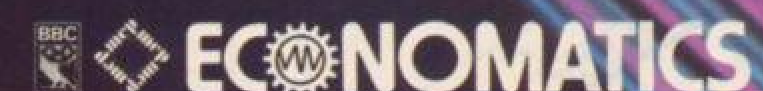


The Buggy's software which is based on the 'building block' principle consists of 12 robust application programs and one familiarisation program all of which feature full graphics.

Take a trip into the future without ever leaving your key-board – drive a BBC Buggy.

PROGRAMS
Test and familiarisation.
Switch – direct computer control.
Memory Switch – demonstrating computer memory.
Routeplanner – advanced version of Snail.
Recorder – route display.
Snail – screen route planning.
Explore for wall – mapping of boundaries.
Explore for object – seeks objects, defines shapes, returns home.
Bar Code Routeplanner – non-keyboard information input.
Tin Pan Alley – composing music by bar codes.
Man vs Buggy – 'Flying blind'.
Sunseeker – seeking a light and negotiating obstructions.
Line Follower – black or white line following.

The BBC Buggy is available from Acorn/BBC dealers and other major outlets.



Send me the BBC Buggy at **£189.00**
inc. VAT, packing and postage

Name
Address
I enclose cheque/PO or debit my Access account (delete as necessary)
Card No.
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Starting out in home computing? First Bytes is for you. Just write to *Your Computer* with any hardware or software problems, no matter how small or simple.

I could do that...

In the piece on sorting and searching, we mentioned the binary search. This month's challenge is to see which reader can come up with the most efficient program, judged by both speed and program size, to implement the binary sort.

Assume that you have an array with sorted data in it already, and try to make the routine as general as possible. Also try to explain as best you can what it is that you are doing. This should help other readers to understand.

Obviously the task set in October's "I could do that" failed to stimulate First Byters' interest or perhaps, proved too difficult.

Not a single entry landed on our desks before the closing date — so, no prize and no solution.

Let us hope this month's poser is less intimidating.

Read Piers Letcher's introduction to sorting first and then try your hand — there is £15 at stake.

Printing to the screen

"There appear to be several methods for printing information from a program on to the screen, but I do not know what they all are, or which to use. Can you help me?"

THE COMMONEST, and most well known method of getting information to the screen is by using the Print command, from Basic. There are an enormous number of different versions of this, not just on different micros, but within each machine. The Print statement comes with many parameters, and can tell the micro precisely where the next piece of information should be printed.

The micro keeps a count of just where on the screen the current



position is, and at the basic minimum, using a Print statement will cause the micro to put the information at the beginning of the next line after this pointer. If the Print statement has a comma in it, that adds a tab's length to the pointer, and the next piece of information gets printed at the next tab marker.

The pointer that the computer *(continued on page 85)*



Sorting — why bother?

"What is the point of sorting?"

IT IS NOT really until you start to use your micro as a tool, rather than a toy, that you start to see the uses for sorting. In fact, it is the close relation of sorting, searching, that is often the more useful of the two.

It is quicker and easier to find a piece of information if the data is sorted first.

If you typed in the data in order anyway, then you would save yourself the trouble of having to sort it out. A problem occurs when you find that you have to store new information. A short program to sort things for you means you can put it where you want.

If you have got a series of addresses in order say, then the most likely thing you'll want to do is to see one of them. This is where a searching routine comes in handy. You could list all of the addresses of people whose name begins with L for example. To do this you need a general search program.

This works on the following principle: Find out where in the address or record the information you are comparing is stored. For example, it might be in the 40th to 50th character positions in a string. Now look at each address, and see if characters 40 to 50 match Cardiff or London. Then if the match is true, print out that record.

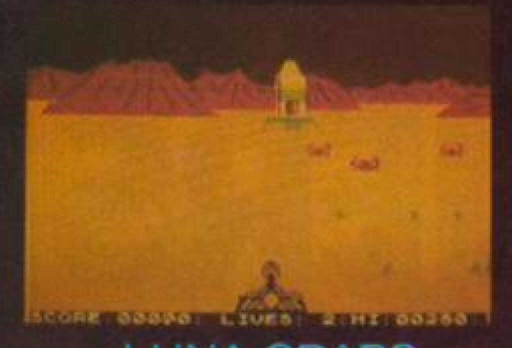
Now if the addresses happened to be in alphabetical order of town names then you could start in the middle, see if the town you are looking for is lower down the alphabet or higher, and then look in the middle of the section you now know it is in, and keep going until you reach the bit you're looking for. This is known as a binary search.

The binary search above only works on sorted data, and so it's a good reason for getting your information in some order. Doing this is simpler than it sounds. If you have an array of 10 numbers, then you can sort it using the array, and just one temporary variable:

```
10 REM SORT ROUTINE
20 DIM A(10)
40 FOR J = 1 TO 10
50 FOR K = 1 TO 9
60 IF A(K)<A(K + 1) THEN GOTO 110
70 LET TEMP = A(K)
80 LET A(K) = A(K + 1)
90 LET A(K + 1) = TEMP
110 NET K
120 NEXT J
```

A very simple refinement to this puts in a count, so that you do not keep on sorting once the array is sorted, as this one does.

Pier Letcher.
(continued on page 85)



LUNA CRABS
By M.J. ESTCOURT

HAUNTED HEDGES
By DEREK BREWSTER



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3D

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(continued from page 83)
keeps is the key to all output to the screen. It is this that makes things like the Print Tab statement work, and it is this that you reset if you want to start a new page on the screen.

Setting a new page is usually done by a command like Cls. This wipes off the old screen, and sets the pointer back to the top left-hand corner of the screen. The Cls command is actually a way of sending the micro a control character.

Control characters

Control characters are much the same as ordinary characters. All characters are represented in the computer as numbers, for example, "A" is represented in the computer as the number 41 — hexadecimal, in ASCII, note that some computers use other codes. So if you wanted to print an A on the screen you could just type

```
PRINT CHR$(65)
```

The reason you used 65 not 41 was that the 41 was hexadecimal, so it needed converting to decimal:

$4 \times 16 + 1 = 65$

In the same way, all of the control codes have numbers.

The control code

The control code for Clear text screen — on the BBC — is given by Control and L, or the number 0C, so if you press Ctrl and L at the same time it should clear your screen. Unfortunately you cannot put Ctrl and L into a PRINT statement, so you have to tell the program to

```
PRINT CHR$(12)
```

instead. This has the same effect as typing Cls in a program.

Matters are further complicated, because most micros have two places in memory that you can print from. One is the graphics area, and the other is the text area. This gives you the text screen, and the graphics screen "windows". You can now print from either to the screen. Your normal print statement etc. will cause text to appear, from the text window. However, with a different command for every machine, VDU for the BBC, GET/ PUT/ SCREEN for the Dragon by way of example, you can now print user-defined characters from the graphics area.

These specialised commands are highly machine specific, since they rely on the way that the memory has been organised on that particular machine.

So, to sum up, it depends on what you are trying to do. Print is usually a perfectly sensible way of outputting to the text screen, and use of control characters, and the machine's own useful functions — like the Dragon's Print @ statement, which allows you to print at any position on the screen, are recommended. First, of course, you have to find out what is available. Again, your machine will have specific commands to deal with printing from graphics areas to the screen. Your manual should at least tell you what commands you can use.

Piers Letcher.

BEGINNERS first bytes

Can you do anything sensible with a home computer?

"Most people use their new micros to learn to program in Basic, and to run games. But can you do much else with a home micro — in particular can you do anything sensible?"

THE ANSWER IS yes — but there are obvious limits, otherwise banks and offices would all be using Spectrums. Software certainly exists for most home micros to at least let you try out word processing, electronic spreadsheets and database management. The limitations are usually imposed by limitations of the hardware.

Word processing is far superior to using a typewriter — once you are accustomed to it it is difficult to go back. The key advantage of a WP program is that what you type appears first on the screen, where you can correct it and manipulate it before finally committing yourself to paper. Most word processors let you move whole blocks of text from one place to another, and let you try out laying out your text in different ways — with wide margins, for instance, or double-spaced.

The main problem of doing practical word processing on a cheap home micro is that it soon gets expensive. Apart from the cost of the software, which may range from £10 to £50 or £60 but which is always more expensive than a simple game program, you obviously need a printer. This may cost at least as much as the micro.

You also rapidly discover you need a decent keyboard if your machine does not already have one. And then you start wanting discs — one of the convenient things you can do with a word processor is keep standard letters and then load them in for small alterations when needed.

Some WP programs will even automatically print out a whole batch of letters, merging a name and address file with your standard letter.

A less obvious problem you discover once you start using your micro a lot to look at text is the quality of the screen. Most home micros are plugged into colour TV sets, which give a less stable image than a monitor or even a black and white TV. Sometimes the display problem lies with the micros themselves, as they are very much designed down to a cost.

A few hours of word processing on the Dragon connected to a colour TV rapidly makes you realise why businesses are prepared to pay a lot more money in the first place to get a proper office system.

Until Visicalc came along no-one had thought of the idea of an electronic spreadsheet. This program was probably responsible for selling more micros than any other piece of software. Visicalc and the host of imitative calc programs let you work out calculations on the screen. You type numbers into boxes in a grid and then type in a formula saying what you want done.

So if you want to add up a column of figures you just type in all the numbers and then, at the place you want the answer to appear, type in the name of the boxes you want added up, for instance B1 + B2 + B3. Much more complicated mathematical operations are possible and you can work with complete rows and columns at a time.

The power of calc programs lies in the ease with which they let you answer 'what if...' questions. What if you just change that number there, what if you alter the formula slightly. You can try out a whole number of different approaches with very little effort.

Calc programs are quite suitable for use on home micros as you can



do a lot of useful work without discs and the quality of the keyboard does not matter much. Although home micros only display a small part of the calc grid you can quite conveniently work with much larger grids than will fit on the screen by scrolling. But it still helps to see as many rows and columns as possible at a time so 80 character by 24 line office machines still score for frequent use.

So-called database programs are the micro equivalent of a card index. The usual approach is for the program to display record formats on the screen, which you can type information into, Save and alter. You really need a floppy disc system.

Most let you select records on a number of different criteria — all people interested in the Oric living in North London for example if you are storing information for a computer club file for example — and some let you sort selected records into order. Unless the selection and sort facilities are good the database program probably has little advantage over a manual card index.

If you intend to do a lot of sensible-type things with your micro it helps to have chosen the right machine in the first place. Taking into account availability of software, quality of keyboard and ease of expansion to discs and printer, the BBC Micro and the Commodore 64 are probably the best home machines

Next probably come the Vic-20 and Atari 800 and 600, which have proper keyboards and a reasonable variety of packages. The Dragon is let down by its display and machines like the Oric and Spectrum by their keyboards. When you count up the cost of all the add-ons you may end up buying, for serious use the more expensive machines may work out better value in the end.

Ian Stobie

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If you have anything of interest to tell us about your computer club why not contact us on 01-661 3144.

Local news

United States

Sinclair Amateur Radio User Group is an American club with around 100 members in 27 states. You have to be a licensed radio ham and be willing to contribute to QZX their newsletter. Send an sae to Paul Newman, 3 Red House Lane, Leiston, Suffolk IP16 4JZ.

Brussels

The Belgian ZX Micro Club which boasts three TV monitors and a wide range of other hardware has just started in Brussels. Contact Michel Hunin, ZX Micro Club, 6 Boulevard Leopold III, bte 15, B-1030 Bruxelles, Belge. Telephone 02-2160125.

Southampton

Southampton Amateur Computer Club has its main meeting on the second Wednes-day of each month at the Medical Sciences Building, Basset Crescent East, between 7.30 and 10.30 pm. There is an active BBC group which meets at the Crestwood Centre on the last Friday of each month. Contact Paul Blitz on Chandlers Ford 69050.

Crewe

The South Cheshire Atari User Group meets on the first Thursday of each month at the Earl of Crewe, Nantwich Road, Crewe. Meeting unofficially for some time, the group has been going in its present form for some two months but already has over 30 members. Topics such as sorting routines have been discussed at recent meetings. Membership is £5 per year for adults, or £2.50 for children. There is also a £7.50 family membership rate. Contact Mr A Davies, 48 Blagg Lane, Nantwich, Cheshire or ring 0270-626969.

COMPUTER club

Paul Bond visits Cambridge to see Acorn's technological hierarchy show off the Electron and really digs the "jazz concert" atmosphere.



CAMBRIDGE

CAMBRIDGE MICROCOMPUTER Club meets on the third Wednesday of every month at the Portland Arms in Milton Street. This worthy hostelry is set in a town that is renowned for far more than its dreaming spires — one club member estimated that there must be anything between 80 and 120 separate companies engaged in some aspect of microcomputer-related work in the area, whether it be design, research or manufacturing.

In the midst of all this micro-genesis, it is only to be expected that CMC itself would attract a rather high-flown or even esoteric following. The club secretary, Derek Tripp, is director of Herald Computers, a marketing company whose standard fare is machines in the £2000-£6000 range. He and his club treasurer had in fact come hotfoot from visiting two computer shows that day in Birmingham, IBS, and a show concerned with the use of computers in agriculture.

The club is now in its third year and thriving — perhaps partly due to the fact that its treasurer attended the same accountancy course at Cambridge Tech as Acorn supremo Hermann Hauser.

The sturdy facade of the Portland Arms, harnessed together with the English licensing laws provide an effective bulwark against microkids — viewed as a definite plus by some club members who feel that the more serious technical aspects of an evening, such as the one that *Your Computer* attended when Acorn's technological hierarchy were there in force, might not be fully appreciated by younger computerniks.

Whatever their feelings about the youth of today in general, the Acorn men were definitely proud of their new baby, the Electron, which is what they were there to talk about. Adrian Warner kicked off for the company, giving us his personal insight into the soul of a new machine. As the BBC project closed in November 1981, the early idea of a "baby to the Beeb" was conceived, but obviously the company had more pressing considerations of production and selling their main model.

In November 1982, emulation began with four double-height Eurocards full of TTL to model the OS and make changes to the ULA. Having one single, complex ULA which handles everything has slowed the Electron down by comparison with the BBC, and not just where processing is concerned. It provided plenty of development and production headaches too.

In April of the same year Alan Boothroyd designed the prototype casing which underwent changes until November. Little things, like ventilation holes underneath to stop the machine frying itself alive were added.

In parallel with the other works, Steve Furber was "doing wonderful things" with Feranti ULAs. While the first printed-circuit boards were ready in September 1982, it was the ULA that killed all hope of a 1982 Electron at Christmas. All the designs until the current Mark G flopped. As the deadline began to slip, a number of goodies were dropped from the specification, though Mr Warner was obviously reluctant to say exactly what they were. He pointed out that it was a 95 per cent density ULA which evoked rapturous cries of "Crazy!" from the audience. For a moment I thought I was at a jazz concert.

Much has been made in the advertising of the machine's environmental testing — "We have a quality manager who drives me mad" — but it makes sense that a machine assembled in Malaysia and airfreighted around the world should be subjected to drop testing and thermal shock. Still the tests have apparently convinced British Telecom's medical micro network, the Chain, that it is worth ordering 20,000 Electron-based terminals.

Which brings us to one of the main points of the evening — the unveiling of the first of a new range of expansion boxes which will instantaneously customise the machine for whatever purpose. Zahid Najan spoke about the expansion philosophy. "Whatever box we come out with has got to be very, very cheap." The box he showed us contained the minimum considered necessary and provided an interface for cartridges containing two 16K Eproms which would provide the Electron with BCPL, or View, for example.

Another project is a disc interface box which actually contains the disc and disc-drive as well. This would be quite different from anything available.

The club, which has around 50 members, publishes its own journal, *Don't Panic*, which is supposed to come out six times a year — things don't always go smoothly, hence the title. Past publications have included articles on baud-rate generation, matrix routines for the BBC Micro, and RS-232 driver and receiver. For further information contact Derek Tripp on 0223 315662.

Star★chart

Wild West Hero

48K Spectrum:
Shoot-'em-up:
Timescape Software:
£5.90

★★★

Like all good Westerns this has a good opening visual and the controls are clearly explained beneath the Wild West saloon bar-type writing. A brief kaleidoscopic display transports you to the Arizona desert where you are suddenly surrounded by tough gun-toting hombres and rather volatile cacti which blow up and kill you when you bump into them. You automatically shoot in the direction you are moving. Once you have made a name as a fast draw, more tenderfeet appear on screen.

The Ultra

48K Oric-1:
Shoot-'em-up:
Personal Software Services:
£6.95

★★★

A touch of nostalgia here for the heady days of 1978 when the first space invaders began to creep into local pubs and arcades suddenly took on a new lease of life. The Ultra, as usual, are an evil race of mutant aliens — anyway they come in 16 waves of increasing mutancy and you attempt to destroy them with your lone laser. Good use of the Oric-1's colour facilities and a quiet/loud option on sound effects. Since a quiet Oric is a contradiction in terms, you should be warned that option two is liable to induce shell-shock.

Tool Box

BBC Model A or Model B:
Utilities:
BBC Soft:
£21.00

★★★★

Over 20 programming aids in machine code and Basic, including a character definer, compacters, a program re-sequencer, variables dump and six sort routines, plus a fat ring-bound manual. A worthwhile collection, even if there are some items you do not need. But beware the Epson graphics dumps: they only work with the MX-80, and the disc version does not go at all.

SOFTWARE Shortlist

Bugaboo

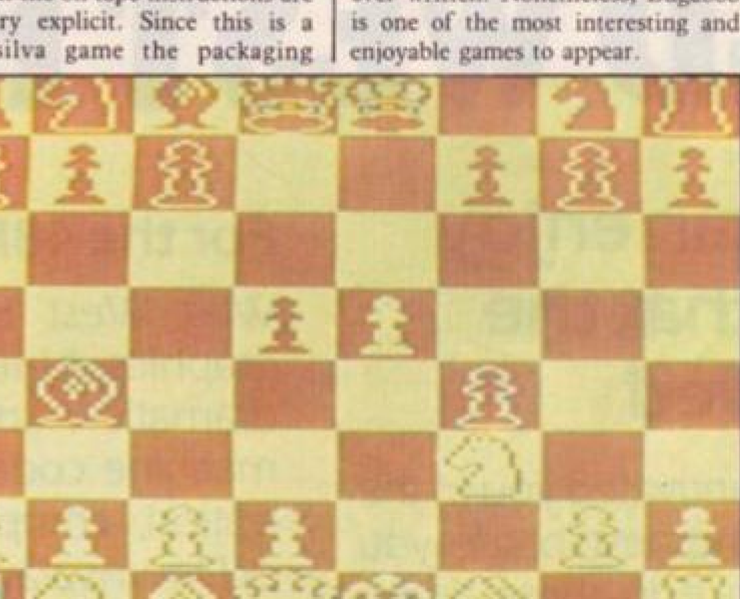
- *48K Spectrum*
- *£6.95*
- *Quicksilva*

★★★

IF YOU HAVE ever had a dog you will know how agile the flea is. Bugaboo is a highly original new program which features an athletic yellow flea of prodigious jumping ability. His task is to escape from the bottom of the screen to the exit at the top. Attempting to thwart his ambition is a vicious yellow pterodactyl which swoops around in menacing fashion.

One of the most attractive features of Bugaboo is its landscape; a multi-levelled collection of dark caves and jagged ledges, decorated with psychedelic coloured mushrooms and shrubs. Cursor keys allow you to scroll left and right, up and down, to view the prospects in store.

Controlling Bugaboo's leaps is a tricky business, not helped by the fact that the on-tape instructions are not very explicit. Since this is a Quicksilva game the packaging contains only a silly blurb, with possibly the most appalling rhyme ever written. Nonetheless, Bugaboo is one of the most interesting and enjoyable games to appear.



Cyrus Chess

- *Dragon 32K*
- *Cartridge*
- *£24.95*
- *Dragon Data*

★★★★

CYRUS CHESS, RELEASED on cartridge by Dragon Data, is a version of the program which won the 1981 European Chess Championship. It has been decked out with quite a few extra facilities. You can set up the board for a problem, run through an already completed game, or take back a move; and, if you wish, the program will demonstrate what it thinks is your best move.

Perhaps the most useful feature is the way it allows you to interrupt its thought-process. At any of the nine levels of playing strength you can force Cyrus to come up with the best move it has found so far. This is a blessing since chess programs can be infuriatingly slow at higher levels.

But all these options are incidential to the most important question one should ask of a chess program — how good a player is it? The answer is that for a home computer program Cyrus plays a surprisingly strong game.

Chess programs are notoriously weak at stategic play. Typically they will defend a pawn with tenacity while ignoring the build-up of a standard king's side attack. Cyrus, however, is rather better than most. It plays a highly agressive game, throwing its pieces forward and piling on the pressure early.

It is all too easy to underestimate the program's skill, especially if you play passively. Before you know it Cyrus has swamped your defences and you are about to be trounced. The best course here is to weather the storm with cautious play: if you are lucky it will then over extend itself.

737 Flight Simulator

- *BBC*
- *£9.95*
- *Salamander*

★★

THERE MUST BE people with more flying time in computer clubs around the land than British Caledonian's entire Hamble intake combined. The trouble is, every time we get real pilots behind one of these computer simulators they tend to say things like "This perpetuates the myth that flying is difficult", or "Last time I went to the Boeing facility all I had to do was push a button and the bloody thing took off by itself."

However this may be, if you can not run to a Piper Comanche at the moment, a flight simulator will give you a better idea of the theory and instrumentation and some idea of how various controls relate than just reading a book — but it is no substitute for the real thing, or even for a real flight simulator. As there is no similarity between the layout of your computer keyboard and the controls of a jet airliner, Salamander has, sensibly, not attempted to recreate the aircraft's control layout on the keyboard.

There is a pause during the loading procedure when you are asked if you want to define your runway — because of geographical features, restricted areas and air

(continued on page 91)



WHAT THEY SAID AT THE PCW SHOW...

"Very impressive graphics" — Tim Hartnell, author of many best selling micro books

"A blimmin' good mega zap" — Jeff Minter, top Vic 20 & CBM64 games programmer

"Very smooth...I'll have one" — Andrew Pennel, author of 'Mastering Your ZX Microdrive'

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(continued from page 89)
traffic control requirements, no two runways are alike. You can even select a scale to suit the size of the chart so that it fits on the screen.

The controls which greet you when the flight deck is put up include compass heading, fuel gauge, DME — distance measuring equipment, artificial horizon, altimeter, gear position indicator, VSI — vertical speed indicator, and IAS — indicated airspeed indicator. It is worth it just for learning the acronyms alone. Future airline disaster movies might do well to feature a scene where, the crew having all been struck low by salmonella and the dipsomaniac conscience-stricken ex-flier having failed to make it up the steps, an unseemly brawl breaks out between owners of ZX-81, Atari and BBC flight simulation programs.

Documentation is excellent with a hardy labelled representation of the flight-deck instrument panel, a quick guide to control keys and a useful flying leson to familiarise yourself with the controls.

This said the visual display itself is not very impressive. There is no view from the cockpit when you take off — you are flying in "low cloud" — which is the computer version of the black square that is supposed to be a picture of a black cat in a coal-hole at night.

The instruments all work, and this is the sort of game that will appeal to people who like figuring out what is going on from instruments.

Chequered Flag

■48K Spectrum
■£6.95
■Psion Computers

★★★★

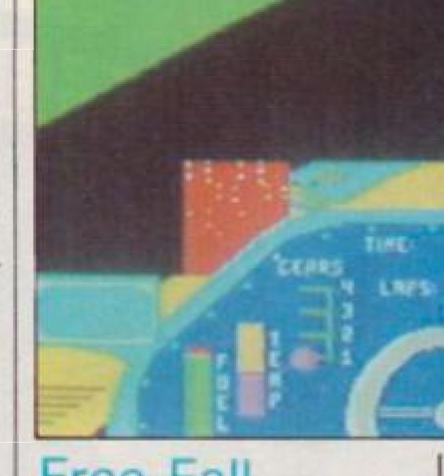
HUNCHED BEHIND the wheel of your Formula 1 racing car the endless ribbon of tarmac unreels towards you at an incredible rate — well, quite fast. This is an impressive simulation of Atari's Pole Position, although for some reason the trees appeared to be red. Perhaps it is autumn.

Rocks, warning arrows, lakes and other landmarks zoom convincingly towards you over the horizon. The engine strains as you go up hills. Instruments require careful monitoring to achieve maximum performance and avoid skidding or overheating. You also get a choice of cars. The Feretti Turbo, the Psion Pegasus and the McFaster Special. Each has its own characteristics — the McFaster has an automatic gearbox, so is ideal for beginners; the Feretti is turbocharged and develops 640 bhp between 8,000 and 10,000 revs per minute.

The dashboard display has fuel and temperature guages, a gear selection indicator, a rev counter, a lap counter and a full analogue speedometer. Real-life hazards such as skidding on oil patches and coming off the road are well-simulated. Running over glass on the road causes a tyre to burst. You wobble violently and the car slows till you can reach the pits.

Ten circuits have been programmed in: anywhere from Psion Park to Saturn Sands, or more terrestrial venues like Silverstone or Monza. There is even a circuit whimsically entitled Micro Drive.

An impressive array of keys are used to get the fine control required, at least eight for actual driving, plus a pause and an abort key. You can turn fast left or slow left for example by pressing different keys, which is great for your co-ordination; however, this is a game which cries out for a joystick option. Nevertheless, this is one of the most effective usages yet of the Spectrum graphics facility.






Groucho

■48K Spectrum
■£10
■Automata U.K.



★★★

OURS IS A WORLD where people do not know what they want and are willing to go through hell to get it. Such was the lot of Pimaniacs, as the helpless purchasers of the last big piece of competition software from Automata became known.

The new mindbender from Portsmouth confirms T R Marshall's opinion that what this country needs is a good five-cent cigar. In fact, there was even one attached to the cassette box. This, and the "smash-hit disco track" on the flip-side, which is a curious fusion of Mark Knopfler vocals and Depeché Mode backing, with a Bonzo Dog Band play-out indicate the company's belief that Pimania and Groucho are not so much adventure games, more ways of life.

The prize you have to keep your eye on in this case is a trip for two to Hollywood to meet the star whose mystery personality is hidden within the program. The lucky duo will fly Concorde to New York then sub-sonic to Hollywood. They come back on the QE2, subject to availability.

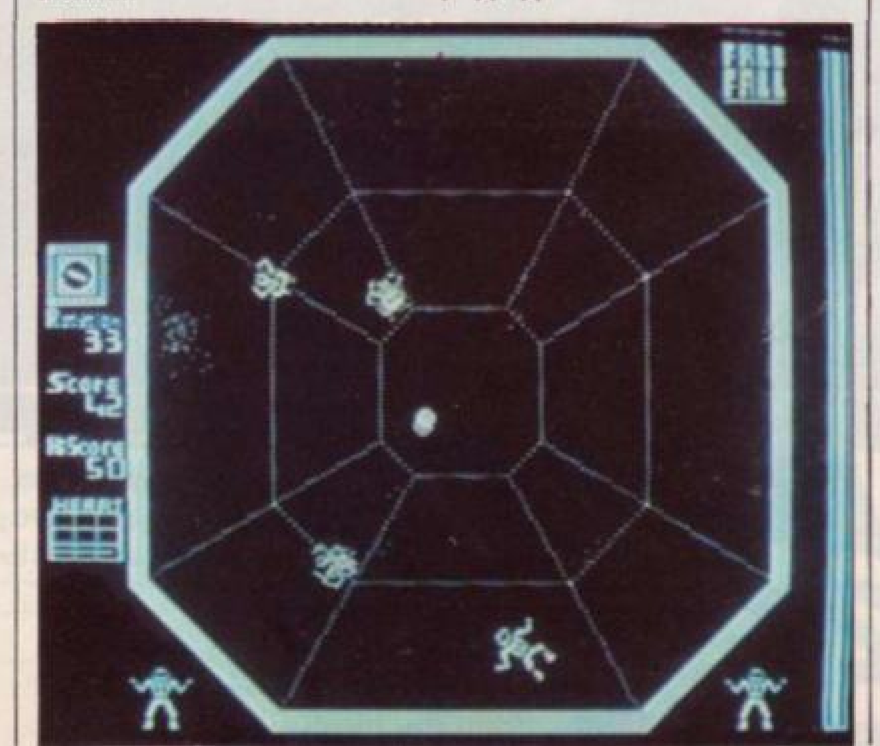
An excellent loading graphic shows the immortal Groucho Marx with twitching eyebrows and his famous cigar. On following the first clue the program correctly deduced that I had never played Pimania and then conversationally asked me to wait a minute. Loading completed, I was plunged in the scenario of Metroville, Burger Valley, Tinsel Town and Indian Creek. Having lost quite a lot of my money in the local casino, I went into a bar where I met a Swedish actress whose name I had to guess from a number of clues.

But of course, I really cannot give too much away, that is the catch when reviewing this sort of game with a prize. Suffice to say the game is humorous and the graphics are excellent.

Free Fall

■Electron
■£9.20
■Acornsoft

★★



A FAMILIAR EVENT in any space-station these days is invasion by alien life-forms. In Free Fall Alphoids have "infected your air supplies with their own cyanide-based atmosphere" and you are the only crew member to have got his space suit on quickly enough. Your task, obviously, is to survive and destroy as many of the Alphoids as possible.

The screen displays the octagonal station around which you float, propelling yourself with jets or pushing off from the side with your arms.

Methods of killing the Alphoids are quaintly old-fashioned; you can punch, kick or ram them. If you can grab hold of one you can use a bomb. The aliens themselves come in the rather terrestrial form of Craboids, Lobstoids and the particularly vicious Warpoids. They will attempt to pinch, sting or bomb you to death.

Free Fall is a monochrome game, Acornsoft having sacrificed colour for high resolution and, as such, is visually rather dull. There are also too many keys for comfort, although you might find it more manageable with a joystick.

Everyone wants to get their hands on The Fuller Gift Pack.

The Fuller gift pack has got to be the computer bargain of the decade; no wonder everyone wants to get their hands on one.

This super gift pack contains the fantastic Fuller Master Unit, the ultimate unit that provides all the requirements for the serious games enthusiast. The Fuller Master Unit incorporates both the Fuller Box and Orator; its amazing features include a speech synthesiser, an independent sound synthesiser, a joystick interface, an amplifier for standard Spectrum sound, a cassette interface and a hi-fi socket. The pack will also include a Master Unit demo tape and full documentation.

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Once your Spectrum has been added to the Fuller Gift Pack you will have an extended computer system that is second to none.

Now you can pit your mind against the four unique, exciting computer games included in the pack. These games have been especially adapted for this superb system and have added arcade sound effects and speech to bring out the very best in your Spectrum.

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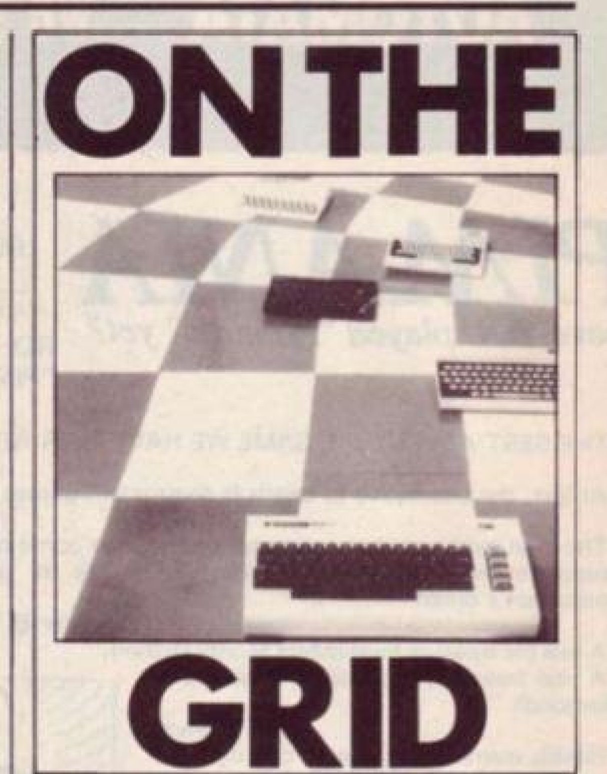
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£100-£400 MICRO SURVEY

ON THE GRID



In the twilight zone between pocket money and a government enterprise loan there are several good reasonably-priced home computers. *Your Computer* assesses the advantages of the machines at the top end of the market and suggests points to ponder prior to paying a pretty penny.

THIS MONTH'S REVIEW covers the computers that cost over £100. The machines can be treated as more than just games players and have the ability to run some of the simple business-type programs. Because of the change of emphasis in use, the general criteria by which a machine is judged shifts as does the required quality of the product.

Last month's preamble regarding the requirements of games machines will obviously not be repeated, but it is necessary to discuss the long-term viability of some of the contenders for your money, followed by the requirements of a home computer being used as a business tool.

The long-term prospects for a number of computer suppliers is not good. There is a need for rationalising and a combining of resources if the U.K. firms are to withstand the imminent challenge of the Japanese and hold back the American push for further market penetration. Divided they will fall.

Design is second to none

The design of the computers is second to none; the problem arises in producing the range of peripherals and software at the product launch, necessary to sustain an initial market penetration with further developments of current and future products. It is no use coming up with a promised accessory a year later.

This requires extremely tight quality-control of the products and an overall discipline that may be lacking in some of the fledgling companies.

On the horizon are several computer systems which, on a computer head to head basis, are way below that of the best UK suppliers. But with huge resources available, the manufacturers are able to offer immediately those facilities which make the system cost effective and not just a technologically advanced toy, with a promised golden future.

The days of being able to market a sub-standard or half-developed product have gone and any manufacturer trying that now will get severely burnt.

Merely financing future developments at or just above existing levels is a recipe for financial disaster. The market is about to split into very low cost home/games computing and business computing. Low cost in the home computing market means very large overseas sales which no U.K. manufacturer has.

The business market is less likely to buy on sales hype and will be expected to take a look at the cost-effectiveness of computer systems, which means available hardware and software.

In the business field most of the manufacturers do not supply or support software, they might distribute the odd game but they are in the business of selling computers. The software houses are likely to be the only source of supported software.

If you know what you are doing, then you can write your own, otherwise the software needs support.

It pays to think of the consequences of hardware breakdown and of the software having a fault:

Are you automatically notified of software faults? — is this service available as an extra?

How long is support guaranteed in writing for your system?

If the computer breaks down, who will repair it? — how long? — will you be able to manage if all the information is now stored in the computer and you cannot get to it?

Do you require back-up facilities? Thus if you are computerising your stock control, what happens if the floppy with all your data on it gets accidentally damaged. How do you recover, not only from the heart attack but also recover the data which may have taken months if not years to accumulate.

At a local level, what about security? Can your computer or data be wilfully damaged?

It sounds a terrible situation to be in. But it is not really that bad, it just needs careful thought and planning to avoid possible disasters that are predictable. A car is not expected to work forever so why expect more from a computer?

Cassette tapes are the cheapest means of off-line data-storage but suffer from several major disadvantages. The data can only be accessed serially — first file first, then second file etc. Data in a cassette file cannot be changed; it is necessary to rewrite the file somewhere else. Getting a particular file can be very slow. The advantages other than that of cost are the general availability of cassettes and the very large storage capacity of cassettes.

Cassette data storage is only suitable in a small number of cases at present. This statement may be reviewed if sending electronic mail to answering machines is proved to be both cheap and reliable.

Microdrives or floppy tapes are a slightly more expensive means of data-storage using an endless loop of tape. The Sinclair Microdrives cost £50 each and can store approximately 90K bytes, the floppy tape drives expected early in 1984 will cost a little over twice that for an extra 50 percent storage.

This means of data-storage is relatively new and it is advisable to duplicate data in a drive until long-term stability is proven. The Microdrive and floppy cartridges permit files to be erased and then rewritten — quite slow of course but the ability to change data is available and that is what counts.

Disc drives and interfaces

More expensive at about £200 are the floppy disc drives, the cost may well be much more because of the need for an interface to control the transfer of data from computer to disc. These can store about 100K bytes of data in single sided format. Double density and double sided disc drives are available but at even greater cost.

There are currently two standard sizes of floppy disc, 8 inch and 5 inch. The 8 inch discs are becoming a bit dated but the 5 inch floppies are reasonably reliable and provide rapid random access to files and data.

Hard discs represent the top end of the storage market, capable of storing very large

(continued on page 95)

(continued from page 93)
amounts of data and providing almost instantaneous access to files. Winchester discs capable of holding over 6 Mbytes are available for approximately £450 plus additional costs for an operating system and interface.

A great deal depends on how much funding is allocated in the computerisation of the business. If you are not sure what to do, buy a cheap micro and play with it for two weeks and then ask your questions. If you dilligently work your way through the manual, there should come an understanding of some keywords being used and at least the user will know whether computing is the right thing.

There is absolutely no point in following the rest of the flock if the user finds it impossible to understand computing, that is just another way of spending money. Computing can bring efficiency, it can also bring incredible waste.

If the decision is to go ahead with computerisation then find the software first — that is the most difficult part — and then buy a computer which will run the programs.

An alternative approach is to use the training facilities offered by a number of the larger retail outlets. These classes are run on a country-wide basis by Tandy and in London by a few of the major stores.

As a guide perhaps the following advice may be of help:

■ Take your time and find the software package that suits your business, ask your association for guidance if you have one.

■ You are looking for a system that suits your needs, that does not mean that you need the "best" computer.

■ Colour may not be relevant in a business software environment.

■ The software bought for the computer and the hours spent in setting up a computer operation will far exceed the price of the computer itself. Cost is a factor but in a business many other items contribute to the total system cost.

Home computing

Please bear in mind that with computers in the price range of £100 to £400 we are talking in terms of home computers providing some of the facilities of real business micros like the IBM.

This machine has a huge array of fully supported software available for almost any business activity, but they do cost money and require a financial commitment.

The choice of using what is effectively a home computer is justifiable, but only providing adequate software is readily available or the user has the inclination to invest a great deal of time and effort in producing the software. ■

ON THE GRID

SORD M5



Price	£179.95
Processor	Z-80A @ 3.6 MHz
Keyboard	Rubber moving key (55 keys)
Available memory	3K bytes
Operating system	Keyword or typed entry
Data correction	No syntax check on entry
Error format	Error codes
Editor	Screen editor (limited)
Cassette interface	250 baud
Display outputs	TV plus video
Basic	Very limited. Needs Basic-G
Expansion	Cartridge — Centronics type I/F
Graphics	16 colours 32 sprites
Pixel resolution	256x192
Colour resolution	256x192
Sound	Three channels plus noise through TV
Games	High quality software but expensive and in short supply.

• The Sord is purely a games machine and does not appear capable of interfacing into disc drives. The use of the cassette interface is likely to prove too slow. The amount of memory available is very small for a machine in this price range. The manuals do not explain clearly how to use the advanced graphics capabilities of the computer which includes two screens which may be alternated for animation.

TRS-80 COLOUR COMPUTER



Price	£179.95
Processor	6809E & 0.9 MHz
Keyboard	Plastic moving key (53 keys)
Available memory	8K
Operating system	Typed data
Data correction	No syntax check on data entry
Error format	Abbreviations and error line number
Editor	line editor
Cassette interface	1500 baud
Display outputs	TV only
Basic	Extended Basic (Microsoft)
Expansion	RS-232 socket & cartridge port
Graphics	Nine colours
Pixel resolution	256x192
Colour resolution	128 × 128 (four colours)
Sound	Single channel through TV speaker
Games	Considering the computer age, the software is expensive and only average in performance.

• The color computer has been around some time now, and has all the peripherals necessary to make an elementary business machine. It is expensive compared to other machines of similar performance. A large machine which has a built in power supply. Software support is likely to be better than that available for any other machine.

MINIMUM BUSINESS SYSTEM

Colour Computer	£179.95
Disc Drive	£400
RS-232 Printer	£150

(continued from previous page)

SPECTRUM 48K



Price	£130
Processor	Z-80A @ 3.5 MHz
Keyboard	Rubber moving key (40 keys)
Available memory	41K bytes
Operating system	Keyword entry
Date correction	Each line syntax checked on entry
Error format	Full error messages
Editor	Line editor, very easy to use
Cassette interface	Reliable 1500 baud
Display outputs	TV Video from rear connector
Basic	Sinclair Basic
Expansion	Edge Connector, I/F1 & I/F2
Graphics	Eight colours — U.D.G.
Pixel resolution	256x192
Colour resolution	32x48 max.
Border	Eight selectable colours
Sound	Single channel beep
Games	Masses of high quality cheap games software

• The Spectrum has a moving key keyboard which not everybody likes. It is probable that your cost microdrive storage will bring about a large range of business software. The lack of descent sound from basic is unlikely to matter in a business context. The ability for several Spectrums to access the same database through Interface 1 is very useful in an educational environment.

MINIMUM BUSINESS SYSTEM	
48K Spectrum	£130
Interface 1	£30
2 Microdrives	£100

MEMOTECH MTX



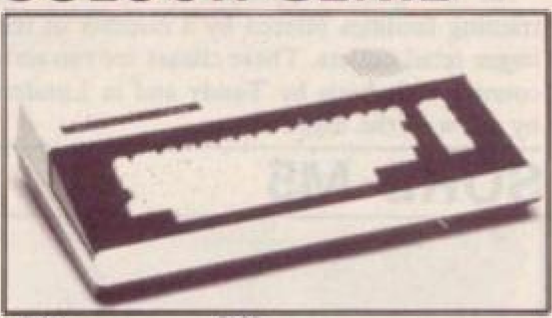
Price	£275
Processor	Z-80A @ 4 MHz
Keyboard	Real keyboard (79 keys)
Available memory	16K bytes
Operating system	Each line syntax checked on entry
Data correction	Fairly good editor
Error format	Full error messages (space sensitive)
Cassette interface	2400 baud — variable
Display outputs	TV and monitor
Basic	Comprehensive with built-in Assembler
Expansion	Centronics & expansion Skt
Graphics	16 colours
Pixel resolution	256x192
Colour resolution	256x192 (16 colours) — Sprites
Sound	Three channels + Hi-fi output
Games	Some games planned

• Again, it is hoped that this computer will be able to run CP/M software in the very near future.

ON THE GRID



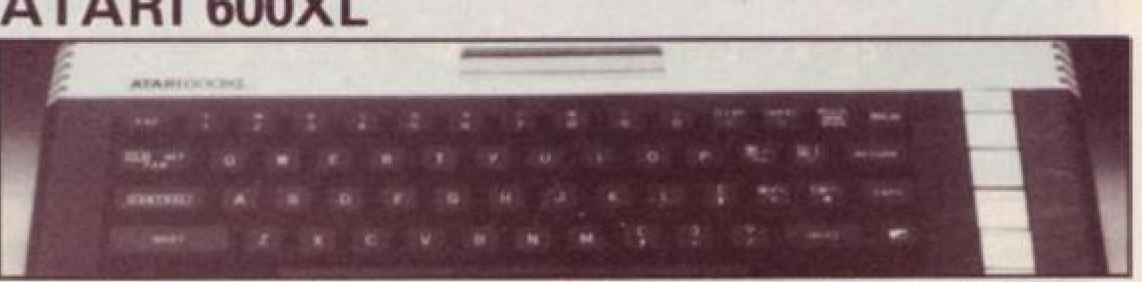
COLOUR GENIE



Price	£168
Processor	Z-80 @ 2.2 MHz
Keyboard	Real keyboard (63 keys)
Available memory	26K
Operating system	Typed entry with function keys
Data correction	No syntax check on data entry
Error format	Abbreviated error messages
Editor	Line editor
Cassette interface	—
Display outputs	TV and video
Basic	Average implementation
Expansion	Parallel interface & cartridges
Graphics	Eight colours
Pixel resolution	160 × 102
Colour resolution	160 × 102 (four colours)
Sound	Multi channel
Games	Not much software available for the games enthusiast

• The latest Colour Genies contain an enhanced ROM with several minor improvements. The inclusion of Integer, single and double precision does make the computer more suitable for business usage but the version of Basic implemented is a little dated. The picture stability on this model was not all that it should have been.

ATARI 600XL



Price	£159.99
Processor	6502B
Keyboard	Real keyboard (63 keys)
Available memory	6-13K bytes
Operating system	Typed entry
Data correction	Each line checked on entry
Error format	Error codes
Editor	Very good screen editor
Cassette interface	Requires an Atari recorder
Display outputs	TV plus video
Basic	Average Basic implementation
Expansion	Parallel bus and cartridge
Graphics	16 colours
Pixel resolution	320x192
Colour resolution	160 × 160 (four colours)
Sound	Four channels through TV
Games	Very high quality

• The Atari 600XL is a repackaged version of the Atari 400 with a smart new keyboard. Much of the published literature on the Atari 400 and 800 computers is the same.

(continued on page 101)



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Computer
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P.L. GRAPHICS SYSTEM

WILL UNCHAIN THE GRAPHICS POWER OF YOUR BBC MODEL B MICRO

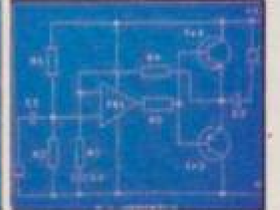
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Missing Signs	£11.90	Meteors	£9.95
Number Balance	£11.90	Arcadians	£9.95
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Density Circuit	£11.90	Cube Master	£9.95
Chemical Analysis	£13.80	Starship Command	£9.95
Chemical Structures	£13.80	Snooker	£9.95
Jars	£11.90	Super Invades	£9.95
		Hopper	£9.95
		Colditz	£9.95

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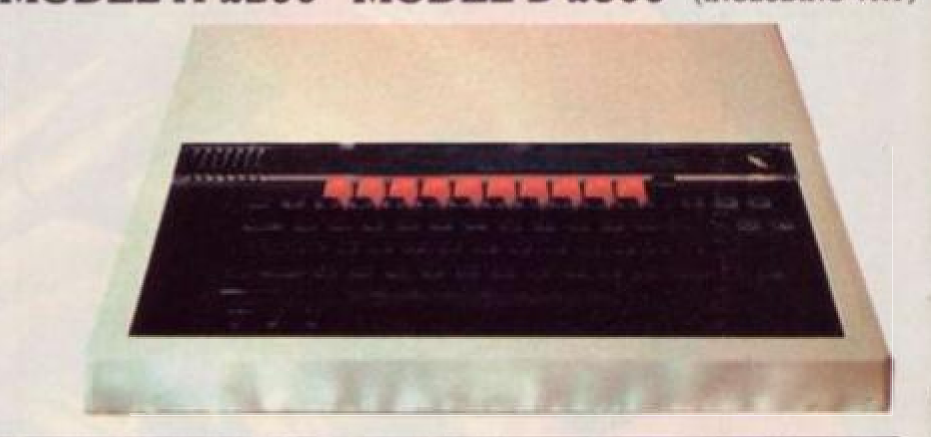
BOOKS



ACORN	
Creative Graphics	£8.63
Graphs and Charts	£8.63
Lisp Book	£8.63
Forth Book	£8.63
BCPL Manual	£17.25
BBC	
The Computer Book	£7.76
The Book of Listings	£4.31

BBC MICROCOMPUTER

MODEL A £299 MODEL B £399 (INCLUDING VAT)



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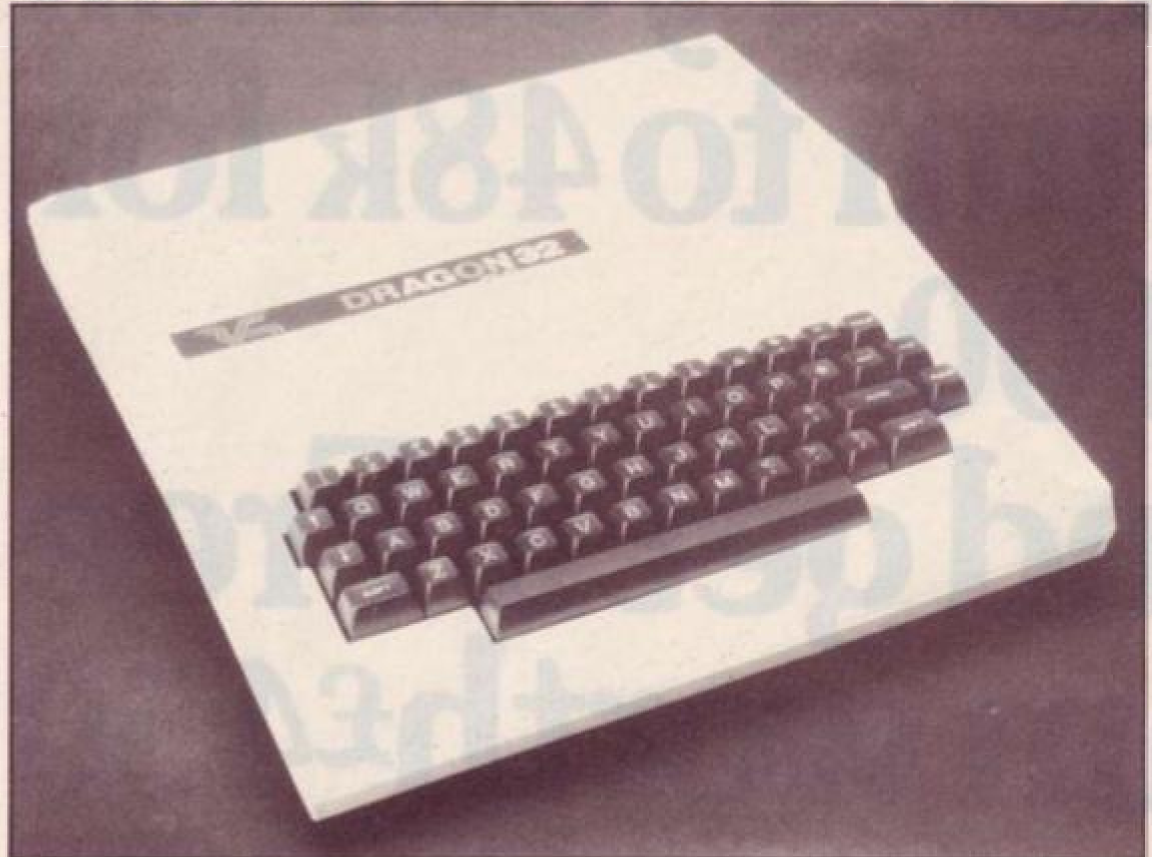
MICROVITEC
14" COLOUR MONITOR
£247.25
(INCLUDING VAT)



12" GREEN SCREEN
£102.35
(INCLUDING VAT)

(continued from page 96)

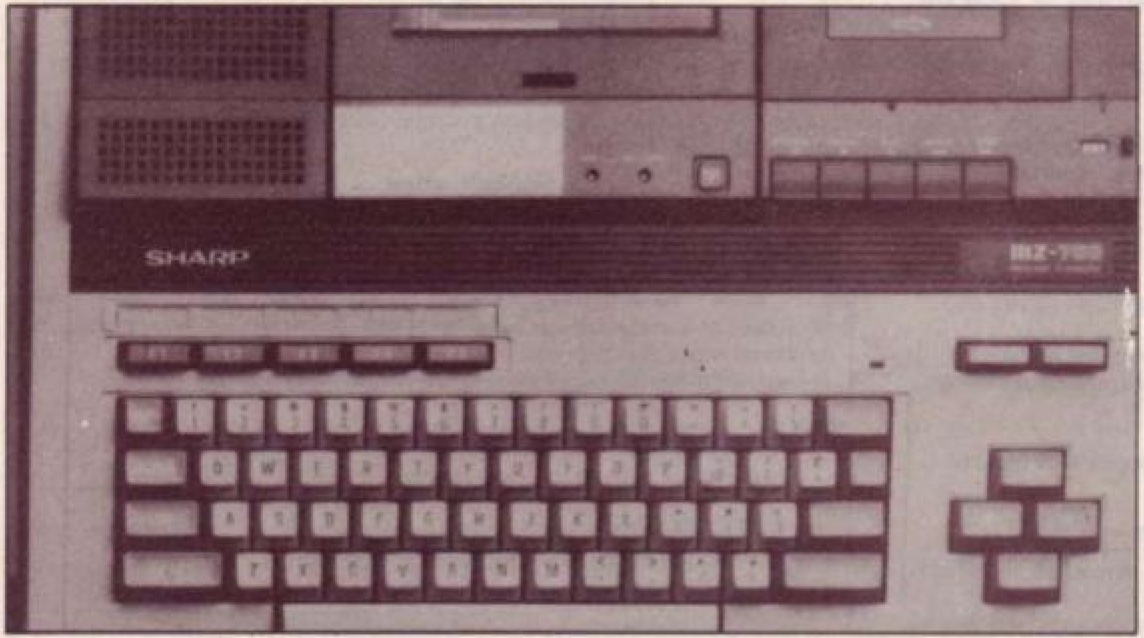
DRAGON 32



Price	£175
Processor	—
Keyboard	Real keyboard (53 keys)
Available memory	25K bytes
Operating system	Typed entry
Data correction	No syntax check on data entry
Error format	Abbreviated error messages
Editor	Line editor
Cassette interface	—
Display outputs	TV and monitor
Basic	Similar to the TRS80 Basic
Expansion	Centronics & cartridge port
Graphics	9 colours
Pixel resolution	256x192
Colour resolution	128x128 (four colours)
Sound	Single channel through TV speaker
Games	As a games machine, definitely superior to the TRS color computer in quantity and quality of games

• The Dragon is based on the TRS80 Colour Computer. Being very similar, most written material is interchangeable. Support on the business side for the Dragon may be considerably below that of the color computer and whether the difference in price is sufficient to forgo such support is extremely doubtful.

SHARP MZ-711

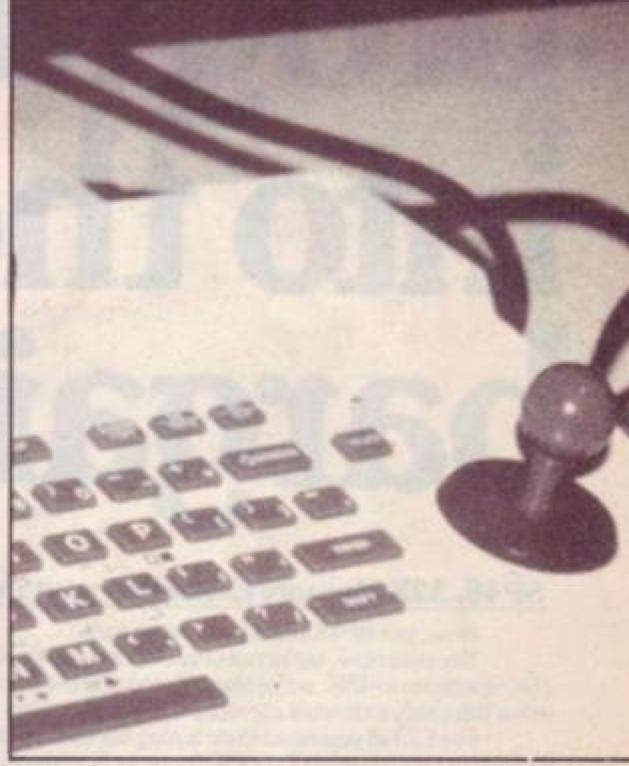


Price	£249.95
Processor	Z-80A @ 3.5 MHz
Keyboard	Real keyboard (69 keys)
Available memory	37K bytes
Operating system	Typed entry & function keys
Data correction	—
Error format	Full error messages
Editor	Screen editor
Cassette interface	1200 baud
Display outputs	TV video and RGB
Basic	Has to be loaded from tape (2-3 mins)
Expansion	Rear connector & Centronics
	I/F
Graphics	Eight colours
Pixel resolution	80x50
Colour resolution	80x50
Sound	Single channel
Games	The screen resolution is not sufficient for most arcade style games

• The MZ-711 takes a slightly different approach to the other computers and has a built-in printer and cassette drive. The printer is the popular 4 colour-pen drive mechanism, but unfortunately it does not test each pen on start up.

ON THE GRID

SPECTRAVIDEO 318



Price	£199
Processor	Z-80
Keyboard	Rubber moving keys
Available memory	13K by[illegible]
Operating system	Single [illegible] or typed keys
Data correction	Very go[illegible] screen editor
Error format	Full err[illegible] messages
Editor	Screen [illegible]tor
Cassette interface	1200/2[illegible]0 baud
Display outputs	TV and video
Basic	MSX basic
Expansion	Motherboard expander & cartridge
Graphics	16 colours
Pixel resolution	256x192
Colour resolution	64x48 (32 sprites)
Sound	Three channels plus noise
Games	A new machine with very little games software available in this country

• This is the first machine to be sold in this country which uses the new Microsoft Basic MSX. It operates in default double precision numerals and aspires one day to be able to run CP/M software. With may of the major Japanese manufacturers about to jump on the MSX bandwagon. We expect the low cost 8-bit computer mass market to succumb by default.

(continued on page 103)

NEW PRODUCT 48/80 FORTH

Extend your 16k Spectrum to 48k for just £23·00. And get a Free program worth £4·50 into the bargain.

Is the manual past chapter 24 a mystery to you? 'Beyond Horizons' shows 48K Spectrum users how to PEEK and POKE systems variables, how to manipulate the display file, how to control the attributes, how to find out how much spare memory is left and much, much more. With the SP48 this program is free. On its own, £4.50.

SP48, 32K Memory Extension with Program – £23.00

Now, our SP48 offers even better value.

Because now, we're not only offering you the facility to up-grade your 16K Spectrum to 48K, we're also offering you the opportunity to be able to utilise this vastly extended memory quickly and easily.

For £23 all you need to do is plug the chip-set into the sockets provided by Sinclair on your issue 2 (or £35 for issue 1) and you have a standard 48K Spectrum fully compatible with all Sinclair add-ons and very low in power consumption.

There is no soldering required.

Fitting and removal are easy.

And the SP48 carries our full warranty and is upgradable, on a part exchange basis, to SP80.

Then all you need to do is LOAD our specially written 48K guide program, 'Beyond Horizons', and your 48K computer will guide you through its memory.

With no need to labour through manuals.

This will save you time, because we all know how easy it is to get lost with memory maps.

SP80 Paged Memory Extension – £46

This ingenious device gives a 16K Spectrum two memory banks of 32K each and a massive total of 80K of RAM.

It can be used as a standard 48K machine, but pages can be switched by software instructions within your program. The SP80 is not recommended for absolute beginners unless used with 48/80 FORTH.

Fitting, power consumption and Sinclair add-on compatibility are identical to the SP48.

Fit and Test service at our premises £3, by registered post £7.

48/80 FORTH – £14.95

This new FORTH compiler/editor is the latest, best and most complete version of FIG-FORTH for the Spectrum. Each tape includes both a 48K version and an 80K version. (Don't forget that an SP48 can be part exchanged for an SP80)

48/80 FORTH gives you the speed of machine code with the programming simplicity of BASIC, and is ideal for games-writing. Unlike other FORTH versions, all the Spectrum's excellent graphics commands are retained, and sound is still available using BEEP. Cassette handling routines are also included.

48/80 FORTH includes a separate FORTH editor which uses part of RAM as if it were disc. The 48K version allows a 16K "RAM disc", and the 80K version a massive 32K "RAM disc".

48/80 FORTH comes with a comprehensive user manual covering both compiler and editor.

ZX Slowloader – £10

This classic piece of software loads ZX81 BASIC programs and arrays straight onto your Spectrum, ready for SAVEing and EDITing. It can do in a few minutes what would normally take weeks of keyboard time.

All products on this order form are in stock at the time of going to press. Same day dispatch for phoned Access and Visa orders.

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☐ SLOWLOADER £10 ______

☐ "BEYOND HORIZONS" program £4.50 ______

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EAST LONDON ROBOTICS

(continued from page 101)

BBC MODEL B



Price	£399
Processor	6502 @ 2 MHz
Keyboard	Real keyboard (74 keys)
Available memory	9-28K bytes
Operating system	Typed entry with function keys
Data correction	Simple to use line editor
Error format	Full error messages
Editor	Line editor
Cassette interface	— baud
Display outputs	TV video and RGB
Basic	BBC Basic with built-in Assembler
Expansion	Centronics, RS232, disc etc
Graphics	Eight colours
Pixel resolution	640 × 256
Colour resolution	320 × 256 (four colours)
Sound	Three channels
Games	A very large volume of quality software available

• The BBC computer has been with us for some time now and has made great in-roads into business use. Its use in the educational field is also pretty extensive. A very fast version of Basic with a built-in assembler. The machine to compare against for a low cost business machine. Will have extreme difficulty in holding that position in 1984.

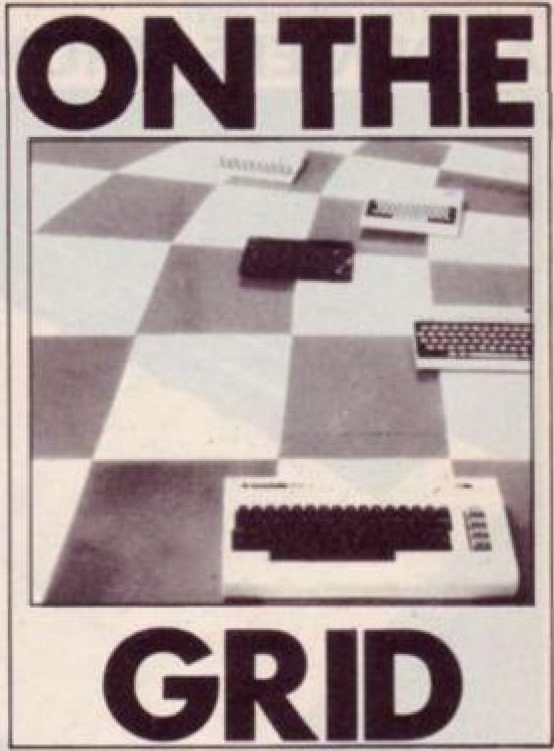
CAMPUTERS' LYNX



Price	£225
Processor	Z-80A @ 4 MHz
Keyboard	Real keyboard (57 keys)
Available memory	14K bytes
Operating system	Typed entry
Data correction	Found to be complicated
Error format	Full error messages
Editor	Line editor
Cassette interface	1200 baud
Display outputs	TV and RGB monitor
Basic	Well structured with built in monitor
Expansion	RS-232 & parallel expansion bus
Graphics	Eight colours
Pixel resolution	256 × 248
Colour resolution	256 × 248 (eight colours)
Sound	Single channel
Games	Not seen as a games machine and very little software available in this area

• The Lynx has, from its earliest days, held pretentions of being a business machine. When it finally can run CP/M software it will have reached its goal. Until then, the amount of software for business purposes is limited and expensive. For some unknown reason, this computer was felt to be more complicated in operation than the others in this review.

ON THE



GRID

ATARI 800



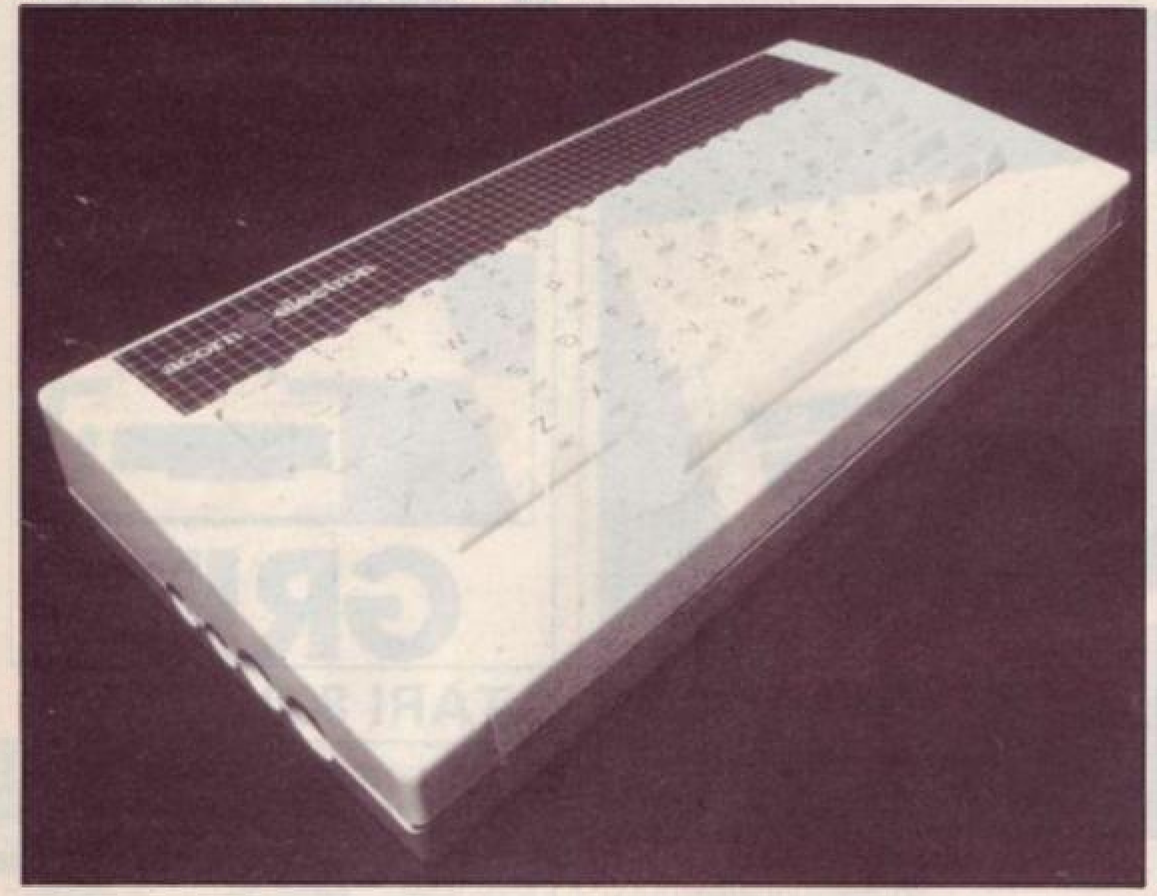
Price	£249.99
Processor	6502B @ 1.8 MHz
Keyboard	Real keyboard (61 keys)
Available memory	38K bytes
Operating system	Typed entry
Data correction	Each line syntax checked on entry
Error format	Error codes
Editor	Full screen editor
Cassette interface	Requires an Atari recorder
Display outputs	TV plus video
Basic	A very good implementation in its day
Expansion	Cartridge ports
Graphics	16 colours
Pixel resolution	320x192
Colour resolution	160 × 160 (four colours)
Sound	Four channels through TV speaker or Int
Games	Very high quality but expensive software

• The Atari 800 has been around a long time and will shortly be superceded by the 800XL. Whether under these circumstances the machine should be bought depends purely upon the level of discount available. Remember to add the price of an Atari recorder to the cost of a system.

(continued on next page)

(continued from previous page)

ACORN ELECTRON



Price	£199
Processor	6502 @ 2 MHz
Keyboard	Real keyboard (56 keys)
Available memory	9-20K bytes
Operating system	Single key or typed entry
Data correction	Simple to use line editor
Error format	Full error messages
Editor	Line editor
Cassette interface	Baud
Display outputs	TV video and RGB
Basic	BBC Basic running approx 2/3 speed
Expansion	50 way rear connector
Graphics	Eight colours
Pixel resolution	640 × 256
Colour resolution	320 × 256 (four colours)
Sound	Single channel
Games	As a games machine, this should challenge Atari in software quality

• A cut down version of the highly successful BBC computer. It operates slightly slower and with only a single sound channel. Cannot help but be a runaway success with the BBC badge behind it. Whether it would achieve such ascendancy over the opposition on its own is questionable. Will need interfaces for printer and disc drives.

COMMODORE 64

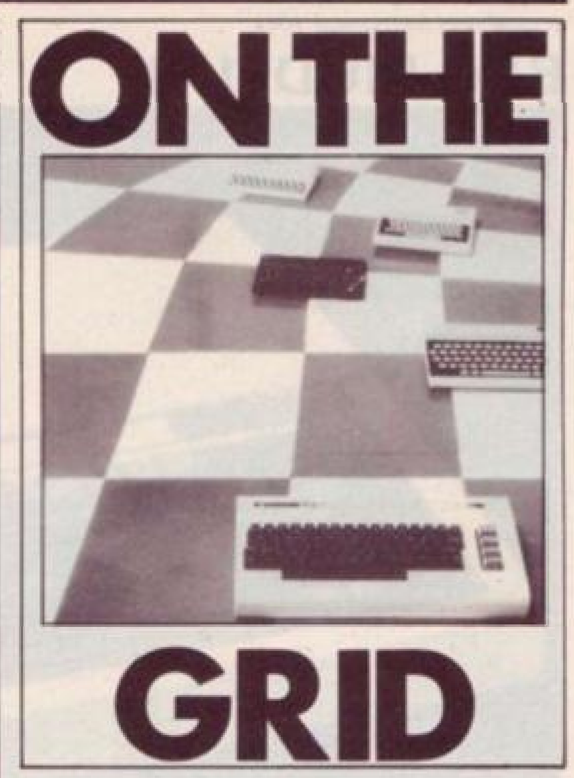


Price	£229
Processor	MOS6510 (6502 compatible)
Keyboard	Real keyboard (66 keys)
Available memory	38K bytes
Operating system	Typed entry
Data correction	Simple to use screen editor
Error format	Full error messages
Editor	Screen editor
Cassette interface	Requires a CAM cassette unit
Display outputs	TV and video
Basic	A rather limited version of Basic
Expansion	Serial port and cartridge port
Graphics	16 colours
Pixel resolution	320x200
Colour resolution	(sprites)
Sound	Three channels
Games	As the price of the '64 is lowered, it broadens its base and comes more into the games market

• The big brother to the million selling Vic-20 is let down by a limited version of Basic. Can be interfaced to a printer, disc drives and fitted with a CP/M option. The Commodore 64 is supported by a reasonable library of business software.

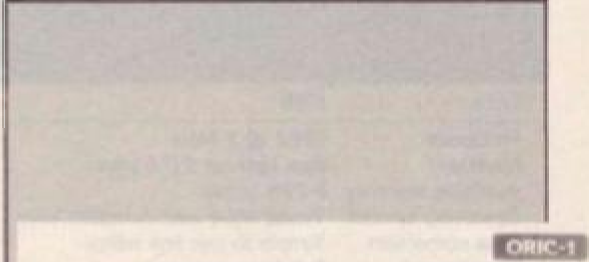
MINIMUM BUSINESS SYSTEM	
Commodore 64	£229
Disc Drive	£229
Printer	£230

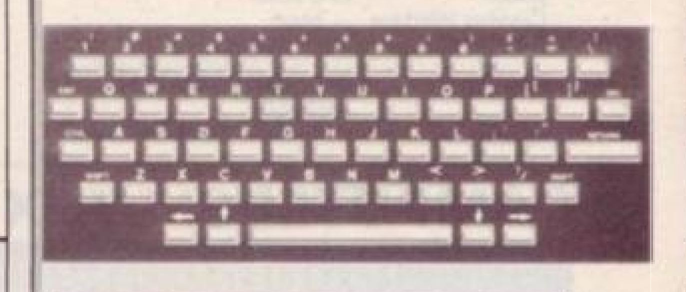
ON THE



GRID

ORIC-1 48K





Price	£139.95
Processor	6502A
Keyboard	Plastic moving key (57 keys)
Available memory	37-44K bytes
Operating system	Typed data
Data correction	Mediocre line editor
Error format	Error messages
Editor	Line editor
Cassette interface	300/2400 baud. Temperamental
Display outputs	TV plus RGB monitor output
Basic	Average implementation
Expansion	Edge connector, Centronics I/F
Graphics	Eight colours – U.D.G.
Pixel resolution	240x200
Colour resolution	80x200 max.
Border	black
Sound	Three channels plus noise
Games	Quality software becoming available

• The Oric, like the Spectrum, does not have a propoer keyboard but does have a space bar. At launch several peripherals were promised which must soon be available? Speed printer — is this the MCP40 at 12 characters/sec max — Oric micro disc and communications modem. Rumour has it that Oric are about to relaunch with the original errors in ROM corrected. ■


DEATH CRUISER
AN ARTIFICIAL INTELLIGENCE GAME
ai
"...you enter an alarmingly different world, in which the awesome new adversarial potential of true artificial Intelligence seeks to dominate."
£5.95
INC. VAT + P&P
For overseas orders please add 50p
48K SPECTRUM
Scramble! – you're the Zarghat commander of a cosmic battleship of fearful power and destructiveness, the 'Death Cruiser.' You're entrusted with the task of defending the galactic corridors of your home planet against a new kind of alien invader – a **super intelligent** breed of biotechnical beings whose prodigious capacity for strategical logic make them potent adversaries indeed! 'Death Cruiser' is more than just a game. In it you enter an alarmingly different world, in which the awesome new adversarial potential of true Artificial Intelligence seeks to dominate.
SPECIFICATIONS: 48K Spectrum, 100% Machine Code, arcade action ★ Ultrasmooth hi-res graphic animation ★ Kempston Joystick compatible ★ Unique multimode intelligence routines; omnidirectional firing ★ Hi-score, on-screen display.
Design by Portland Artists
To: NOBLE HOUSE SOFTWARE, 29 Kingbrude Terrace, Inverness, Scotland
Please send me Death Cruiser/s
Name
Address
Signature
Access No.
I enclose *cheque/*P.O. payable to NOBLE HOUSE SOFTWARE: £
*Delete as applicable. TRADE ENQUIRIES WELCOME
NOBLE HOUSE SOFTWARE
29 Kingbrude Terrace
Inverness
Scotland
NHS

PRINTER REVIEW

David Horne with a quick guide to the best printers on the market.

THERE IS A VERY large and bewildering choice of printers available for the computer hobbyist and not a great deal of published work regarding the suitability of the machines for specific tasks. It is not possible to look at all the combinations of computers and printers but I hope to give a guide as to what can be expected from printers in each price bracket.

I have also highlighted the points that the user should evaluate when contemplating the purchase of a printer. The factors will be weighted differently depending upon whether the required use is business, educational or



hobbyist. For this reason I have simply stated the advantages and disadvantages of each approach.

The machines reviewed are all very good value for money and have been chosen on the basis of offering the most facilities within a given price-bracket.

As a general introduction it should be said that ideally a printer should have both Centronics and serial interfaces. It is logical that as the number of homes with more than one computer increases, whether it be one computer per child or just a spare computer, that each computer should be able to share the expensive peripheral devices that are used infrequently.

The annual/biannual cost of upgrading your system can be significantly reduced by purchasing a printer with the common interfaces — RS-232 and Centronics, although just as the last few years have seen an enormous expansion in the areas in which home computing is used, the same is about to happen to the printer.

What this actually means is do not buy a badge-engineered product if it has reduced facilities i.e., either the RS-232 or Centronics interface removed, unless there are overwhelming financial reasons for doing so. It could provide a limitation on your future choice of computers.

The two current main uses of a printer are to obtain listings of a Basic program and to perform word-processing activities. All the printers are suitable for producing listings. Some users may like wide listing paper so that comments may be added to the right of the relevant lines of Basic, but usually these would be added as Rem statements.

The reason normally given for adding comments separately from the listings is either

(continued on page 109)

TANDY CGP-220



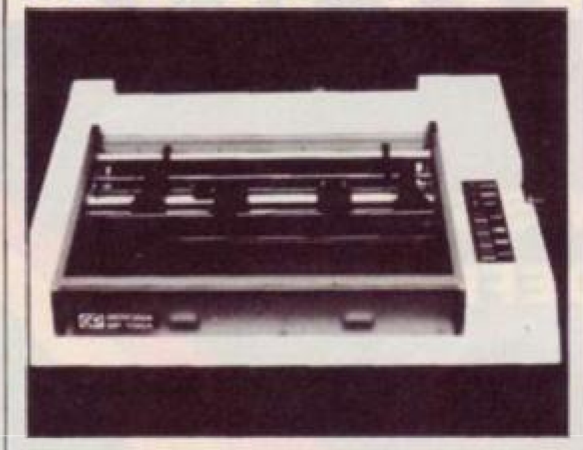


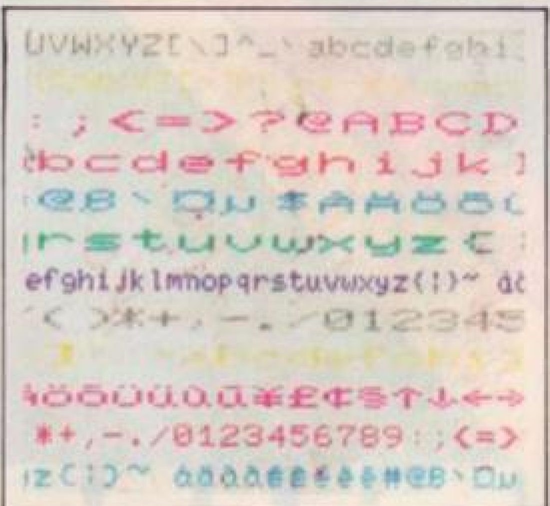
Price £499		
Speed chars/sec	37	
No. chars/line	91	
Type of paper	plain	
Paper width	8	
length	135'	
No. shts	—	
cost	£9.95/3	
Cost of		
Ink cartridge b/w	£6.95	
col.	£9.95	
Print capability	yes	no
Upper/lowercase	✓	
Graphics	✓	
Screen dump	✓	
Colour	✓	
INTERFACES		
RS232	✓	
Centronics		

A very high quality 7-colour ink jet printer capable of excellent text and graphics performance. Very easy to load and unload ink cartridges, which can quickly be set 'off' for long periods of no use. Quiet in operation. The character set is in two parts with the 'sign' in what is called the 'European set' at CHGR$ (163). Colour resolution is 320 pixels across the paper although the dot resolution is 640 because the colours tend to mix. Each ink cartridge is sufficient for about 8 rolls of paper. Centronics and serial interfaces.

CONTROLS
CHR$ 10 Linefeed
CHR$ 13 Carriage Return
CHR$ 18 Bit image graphics
CHR$ 28 Repeat commands
CHR$ 30 Exit bit image

SEIKOSHA 700A





Price £725 + VAT		
Speed chars/sec	38	
No. chars/line	106	
Type of paper	plain	
Paper width	10"	
length	11"	
No. shts	9½"	
cost	£16 for 2,000 sheets	
Cost of pens	N/A	
ribbons	£2.50	
Print capability	yes	no
Upper/lowercase	✓	
Graphics	✓	
Screen dump	✓	
Colour	✓	
INTERFACES		
RS232		✓
Centronics	✓	

A very nice looking colour printer that has the ability to produce colour screen copies. Each pixel is colour addressible. There is software control over formfeed and lines/page. Centronics interface only. There is a copy command for screen dumps. When the optional extra screen dump board is installed. Does not appear as noisy as the two less expensive Seikoshas.

CONTROLS
CHR$ 10 Linefeed
CHR$ 12 Formfeed
CHR$ 13 Carriage Return
CHR$ 14 Double width characters
CHR$ 15 Standard characters
CHR$ 16 Print start position address
CHR$ 20 CR without LF (DC4)
CHR$ 27 ESC commands
CHR$ 28 Repeat commands

TANDY CGP-115





Price £149		
Speed chars/sec	12	
No. chars/line	80	
Type of paper	plain	
Paper width	4.5	
length	150'	
No. shts	N/A	
cost	£4.99/3	
Cost of pens	£1.99/3	
ribbons	N/A	
Print capability	yes	no
Upper/lowercase	✓	
Graphics	✓	
Screen dump	✓	
Colour	✓	
INTERFACES		
RS232	✓	
Centronics	✓	

A colour printer that has virtually become the standard, in many different badge engineered forms. Capable of high quality plotting and of screen dumps in colour. Low noise level and very good quality print but a trifle slow. Has limited capability of setting different print parameters, i.e. Carriage Return or Carriage Return and Line Feed.

CONTROLS

CHR$ 8 Backspace
CHR$ 10 Line feed
CHR$ 11 Reverse linefeed
CHR$ 13 Carriage Return
CHR$ 17 Set text mode
CHR$ 18 Set graphic mode
CHR$ 29 Change colour

There is also a range of controls in graphics mode to enable the printer to operate as a four-colour plotter.

(continued from page 107)
program security — it makes it easier for someone else to follow if a program is correctly annotated — or that the comments can be written in a different colour and therefore stand out much better, enabling the reader to gain a better insight to the workings of the program.

With the limited memory available on many machines, the use of valuable RAM working space on formatting neat program notes for easy reading — if it is not neatly tabulated it will not be very easy to see the remarks — is not something that the user will usually contemplate.

The advent of the very popular four-colour printer plotter enables the user to provide his own listings with remarks coloured for easy viewing. Inserting a pen which has run out of ink into the appropriate colour pen holder — you must not run the mechanism with a pen missing — will provide copies without visible remarks. It took me ages to think of this use for an old dried up pen. Waste not want not.

For word-processing the needs of the enthusiast are not the same as the small business. Generally speed is not that important as the quantity of processed text will be small. The requirement for an A4 print is also not quite such a necessity, as it is just possible to get away with less. For instance, sending text to a magazine in 40 column format will generally be OK as that is how we print it.

Accepting that narrow text is in certain cases permissible, it should only be considered as an interim solution until finances permit the acquisition of a A4, 8 inch wide paper, printer.

Another consideration for word processing systems is lower case descenders. This is the portion of the printed character that is below

(continued on page 111)

BROTHER EP-22



```
There is a very larg
computer hobbyist and
suitability of the mac
at all the combinatior
guide as to what can b
  I have also highligh
contemplating the purc
differently depending
educational or hobby
advantages and disadva
  The machines reviewe
chosen on the basis of
```

Price £170		
Speed chars/sec	17	
No. chars/line	75	
Type of paper	plain/Thermal	
Paper width	A4	
length	—	
No. shts	N/A	
cost	£2.85 for 100	
Cost of pens	N/A	
ribbons	£5.70 for 5	
Print capability	yes	no
Upper/lowercase	✓	
Graphics		✓
Screen dump		✓
Colour		✓
INTERFACES		
RS232	✓	
Centronics		✓

A portable printer that can be used as a typewriter, a calculator and as a word processor, capable of storing approx one page of A4 text with the power switched off. Currently the cheapest 'wide' paper printer. I would have liked to use it to enter data into the computer but nonetheless a very good printer. The keys are a trifle 'light' with no audible feed back. The 16 character LCD display shows what is being typed in and allows a measure of text correction. This is a new concept in printers. There are no lower case descenders.

CONTROLS
CHR$ 8 Backspace
CHR$ 10 Linefeed
CHR$ 13 Carriage return (as selected)

ZX PRINTER



```
1110 IF Y-F<0 OR Y-
GOTO 1130
1120 PRINT AT Y-F,X
1),X;
1125 IF PEEK (PEEK
ODE "O" THEN GOSUB
1127 PRINT AT Y-(F+
-F,X;" "
1130 NEXT F
1135 PRINT AT Y-6,X
1136 PRINT AT 0,X;"
1150 PRINT AT Y,X;"
1180 LET FR=FR+1
1190 RETURN
1199 REM ******** R
1200 FOR F=1 TO 5
1205 PRINT AT Y,X;"
```

Price £40		
Speed chars/sec	50	
No. chars/line	32	
Type of paper	metallized	
Paper width	4"	
length	65'	
No. shts	N/A	
cost		
Cost of pens	N/A	
ribbons	N/A	
Print capability	yes	no
Upper/lowercase	✓	
Graphics	✓	
Screen dump	✓	
Colour		✓
INTERFACES		
RS232		✓
Centronics		✓

Probably the cheapest means of producing hard copy output from a computer. Special Sinclair interface prevents its use without an adaptor on other computers, at which price you should consider other printers. The metallized paper rolls are of variable quality and can produce faded bands of printing. The accumulation of particles inside the printer affect the drive logic leading to alternate line offsets and rather peculiar characters. The printer is also prone to become noisy after prolonged use. The solid bar roll holder is a useful accessory and helps in overcoming the initial sticking of the paper drive. Very fast COPY, LLIST and LPRINT. Plotting and user defined graphics available.

NEC PC-8221A

```
  20 CLS : PRINT "   FULL-WIDTH PRIN
SYSTEM  "  25 LET st=64736  26 PRINT
 48K version"  30 PRINT "*      @ Hil
ay Ltd 1983"  32 PRINT '''"You may a
r questions to     adapt this printe
tem to yourparticular printer. In ma
   cases this is not necessary:     
press ENTER.";AT 20,0;"Do you want t
apt the system to your printer? ";:
E 0: IF INKEY$<>"y" THEN  GO TO 4000
 CLS : PRINT "You will be asked some
       questions. If the answer is a"
 PRINT "number, pressing ENTER will
enter the [default] value."  70 LET
4736  80 INPUT ("How many characters
 line    does your printer have [";P
(st+133);"]?"), LINE a$  90 LET d=PE
st+133): GO SUB 1000 100 IF d<32 THE
LS : PRINT "(Your printer is too nar
for the screen copy routine)."; BEEP
10: PAUSE 150 110 POKE st+133,d 130
: PRINT "          NORMAL CHARACTER SET
 " 131 PRINT "Not all printers have
        character set identical to tha
 the ZX Spectrum, though most" 132 P
 "are the same. In particular,    ch
#,',', and a. If some of  these are
available, use a  similar character.
3 PRINT '"The Spectrum uses 8 as the
k-space code." 134 LET a=127: INPUT
t code does your printer use for bac
ce (probably 127)?";q$: IF q$<>"" TH
LET a=VAL q$ 135 IF a<0 OR a>255 THE
0 TO 134 136 POKE st+175,a 139 CLS
LET c=0: FOR x=0 TO 29 STEP 6: FOR y
0 19 150 PRINT AT y,x;CHR$ (c+32);"-
EK (st+c);"  ": LET c=c+1: IF c<>128
THEN  NEXT y: NEXT x 180 INPUT "Char
r to modify (or ENTER iffinished)? "
190 IF b$="" THEN  GO TO 300 200 IF
 " OR b$>"a" THEN  GO TO 180 210 INP
"Enter new code for ";b$(1);" [";PEE
t+CODE b$-32);"]? "): LINE a$ 220 LE
PEEK (st+CODE b$-32): GO SUB 1000 23
KE st+CODE b$-32,d: GO TO 140 300 CL
PRINT "     USER-DEFINABLE GRAPHICS
```

Price £80		
Speed chars/sec	—	
No. chars/line	40	
Type of paper	thermal	
Paper width	3	
length	150'	
No. shts	—	
cost		
Cost of pens	—	
ribbons	—	
Print capability	yes	no
Upper/lowercase	✓	
Graphics	✓	
Screen dump	✓	
Colour		✓
INTERFACES		
RS232		✓
Centronics	✓	

Currently the cheapest Centronics and the cheapest dot addressible printer on the market. Exceptional value for money. Run by four penlight batteries or a mains adaptor. Limited paper width of 3 inch. Very quiet in operation and completely portable.

CONTROLS
CHR$ 10 Line feed
CHR$ 13 Carriage return
CHR$ 14 Double size printing
CHR$ 15 Standard printing
CHR$ 27 ESC Used to produce user defined graphics which may be 16x16 pixels in size.

(continued from page 109)

the general base level of the printed capital letters i.e., the lower case letters g, j, p, q and y. If these sit up on a line the text can become difficult to read, with problems in differentiating between the g, q and 9.

All the printers will work within a normal office environment without creating a significant noise problem, but the dot matrix printers and the ZX printer can cause a disturbance in a domestic environment especially late at night.

In this respect the ink jet and thermal printers are the most suitable, but clearly do not have the capability of producing multiple copies from multi-part paper. I know it's obvious but with the colour matrix printer, only the original is coloured, the carbon copies are black and white.

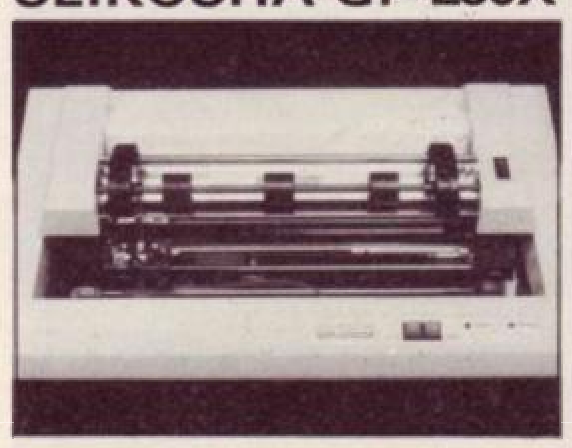
One of the main uses to which printers will be put in the very near future is electronic mail. Messages can be transmitted to suitably equipped sites at 1200 baud, usually at less cost than posting a first class letter, which should arrive the next day, or of sending the message orally over the telephone.

Think of all the post that you send and how much of it could be serviced in this manner including the payment of bills using a credit card facility. It could be seen in today's climate as a way of greatly reducing costs in a very labour intensive industry.

The development of electronic mail is dependant upon the advent of very cheap Modems, which are also responsible for holding back the demand for access to large database networks. We really are very close to the electronic communications age, not just for big business but also the general public, with all its obvious advantages and sometimes not so obvious perils.

(continued on next page)

SEIKOSHA GP-250X



```
 !"#$%&'()*+,-./012345
pqrstuvwxyz{|}~ àäàãé
 ! " # $ % & ' ( ) *
H I J K L M N O P Q R
p q r s t u v w x y z
¥ £ ¢ ↑ ↓ ← → P Q R
 !"#$%&'()*+,-./012345
pqrstuvwxyz{|}~ àäàãé
 ! " # $ % & ' ( ) *
HIJKLMNOPQR
```

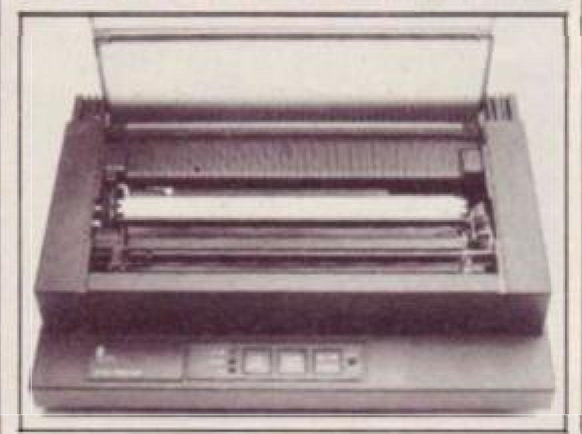
Price £260	
Speed chars/sec	50
No. chars/line	80
Type of paper	plain
Paper width	10"
length	N/A
No. shts cost	£15 for 2,000 sheets
Cost of pens	N/A

Print capability	yes	no
Upper/lowercase	✓	
Graphics	✓	
Screen dump	✓	
Colour		✓
INTERFACES		
RS232		✓
Centronics	✓	

A very good business machine but not really suitable for the home where the noise and installation may be a problem. Cover removal is required to gain access to switch selectable functions including baud rate. Dual centronics and serial interfaces. Paper feed not very easy to use. Has control over print operations, with form feed and lines/page.

CONTROLS
CHR$ 7 Bell
CHR$ 10 Linefeed
CHR$ 12 Formfeed
CHR$ 13 Carriage Return
CHR$ 14 Double width characters
CHR$ 15 Standard characters
CHR$ 16 Print start position address
CHR$ 20 CR without LF (DC4)
CHR$ 27 ESC commands
CHR$ 28 Repeat

OLIVETTI INK JET



```
!"#$%&'()*+,-./0123456
qrstuvwxyz{|}¯!"#$%&'(
cdefghijklmnopqrstuvwx
UVWXYZ[\]^_`abcdefghij
GHIJKLMNOPQRSTUVWXYZ[\
9:;<=>?@ABCDEFGHIJKLMN
+,-./0123456789:;<=>?@
{|}¯!"#$%&'()*+,-./012
mnopqrstuvwxyz{|}¯!"#$
_`abcdefghijklmnopqrst
QRSTUVWXYZ[\]^_`abcdef
CDEFGHIJKLMNOPQRSTUVWX
```

Price £400	
Speed chars/sec	66
No. chars/line	132-80
Type of paper	plain
Paper width	8-9"
length	N/A
No. shts cost	£15 for 2,000 sheets
Cost of ink	£7.50

Print capability	yes	no
Upper/lowercase	✓	
Graphics	✓	
Screen dump	✓	
Colour		✓
INTERFACES		
RS232		✓
Centronics	✓	

A very fast quiet ink jet printer with manual control of the print intensity. Capable of very high quality graphics. I could not use the roll paper as the machine was supplied without a left hand support bracket.

CONTROLS
CHR$ 7 Bell
CHR$ 9 Horizontal Tabulation
CHR$ 10 Linefeed
CHR$ 11 Vertical tabulation
CHR$ 12 Formfeed
CHR$ 13 Carriage Return
CHR$ 14 Double width characters
CHR$ 15 Standard characters
CHR$ 16 Print start position address
CHR$ 20 CR without LF (DC4)
CHR$ 27 ESC commands
CHR$ 28 Repeat commands

TANDY TP-10



```
⌛ !"#$%&'()*+,-./01234
~⌛ !"#$%&'()*+,-./0123
}~⌛ !"#$%&'()*+,-./012
|}~⌛ !"#$%&'()*+,-./01
{|}~⌛ !"#$%&'()*+,-./0
z{|}~⌛ !"#$%&'()*+,-./
yz{|}~⌛ !"#$%&'()*+,-.
xyz{|}~⌛ !"#$%&'()*+,-
wxyz{|}~⌛ !"#$%&'()*+,
vwxyz{|}~⌛ !"#$%&'()*+
uvwxyz{|}~⌛ !"#$%&'()*
tuvwxyz{|}~⌛ !"#$%&'()
```

Price £80	
Speed chars/sec	30
No. chars/line	32
Type of paper	thermal
Paper width	4"
length	65'
No. shts	N/A
cost	£2.80/2
Cost of pens	N/A
ribbons	N/A

Print capability	yes	no
Upper/lowercase	✓	
Graphics	✓	
Screen dump		✓
Colour		✓
INTERFACES		
RS232	✓	
Centronics		✓

Currently the cheapest RS-232 printer on market. The quality is extremely good but limited to 4 inch wide paper and 32 chars. The printing is very quiet spoilt by a comparatively noisy line feed ratchet.

Graphics capability is limited to quarter character cell blocks. There are no lower case descenders in the character set. Currently the best print quality for under £100.

Note that all examples are actual size. The cost of the Seikosha 700A featured on page 107 is about £440 and not £725 as indicated. Other prices should only be taken as a general guideline.

(continued from previous page)

I hate to think what is actually going to happen to the network when the 'enthusiast' gets hold of it with an intelligent terminal; with the new electronic exchanges I can not see how it will be stopped.

A printer uses what is euphemistically called consumables. These affect the ability of the user to actually print hard copy output. In an office, if the printer runs out of paper, either to to the stationery cupboard and get another botx or get some from a local stationery stockist.

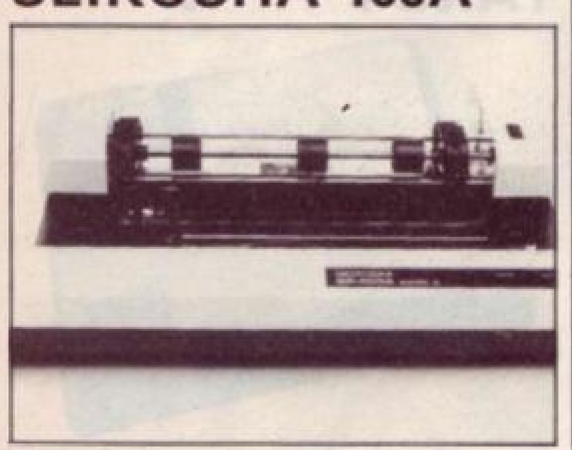
It is not quite that easy in the evening at home, a hobbyist is unlikely to carry a large range of spares so it is worth considering what levels of spares is required. A ribbon can dry out if left for any length of time unused and exposed. In such cases, wind the ribbon back and forth to wet it from adjacent inked portions of the ribbon.

Always cap ink pens when not in use. If these run out then your stuck. Users of the four-colour printer mechanism may prefer to purchase replacement pens from a Sharp stockist who provides packs of four pens — one of each colour.

Ensure that if the equipment is battery operated, the batteries have sufficient charge to produce a clear print, otherwise use the main adaptor. As a general rule, roll paper as supplied is less likely to contain creases and is also less likely to jam. If you use fanfold paper, there may be a requirement for a form feed, otherwise printing over the perforated tear may occur, which besides being difficult to read, creates a lot of printing noise.

The space requirements of fanfold paper is much greater than that of roll paper behind the printer, think very carefully about how and where you intend to install your printer. It is not usually a problem. ■

SEIKOSHA 100A



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Price £215		
Speed chars/sec	50	
No. chars/line	80	
Type of paper	plain	
Paper width	4-10"	
length	N/A	
No. shts	N/A	
cost		
Cost of pens		
ribbons		
Print capability	yes	no
Upper/lowercase	✓	
Graphics	✓	
Screen dump	✓	
Colour		✓
INTERFACES		
RS232		✓
Centronics	✓	

One of the cheapest dot matrix printers with graphics capabilities. Can be used with two part paper to produce carbon copies. The top cover has to be removed to gain access to CR or CR/LF switch. Paper feed not very convenient, can be upgraded for RS232, the cassette ribbons easy to install. A UK character set may be used which puts the £ on Shift-3 key. No lower case descenders.

CONTROLS
CHR$ 8 Backspace
CHR$ 10 Linefeed
CHR$ 13 Carriage Return
CHR$ 14 Double width characters
CHR$ 15 Standard characters
CHR$ 16 Print start position address
CHR$ 20 CR without LF (DC4)
CHR$ 27 Horizontal dot address
CHR$ 28 Repeat command

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ALL OVER THE COUNTRY this Christmas children will wake to find their stockings grotesquely bulging. Yes, Santa has brought them a nice Commodore 64 or a homely Vic-20 all the way from Greenland. Or wherever it is he lives. If they haven't been broken on the trip down the chimney, then those children — and adults — will need some software.

If they are lucky they will have been given some of the better programs from the wide range available for these two machines. But if the mere thought of Christmas depresses you and the thermal underwear is not keeping the mid-winter chill out of your bones, you might like to plug in a program that transports you to the balmy days of summer.

Hovver Bovver, from Llamasoft for the CBM-64, will do just that although, as the name suggests, there is not a lot of peace and goodwill around. The bizarre imagination of Jeff Minter has here turned suburban contentment into a screaming battleground of dogs, gardeners and ordinary old chaps.

As Gordon Bennett you borrow Jim's Air-Mo to do the lawn thinking that "Jim won't mind if I borrow his mower." Jim, however, minds very much and comes raging after you to re-posses his machine. As you try to avoid him you are helped by your local hound, Rover, snapping at Jim's ankles to keep him away. But Rover does not like the sound of the mower so you have to keep an eye on the Dog Tolerance and Dog Loyalty displays.

Horticultural holocaust

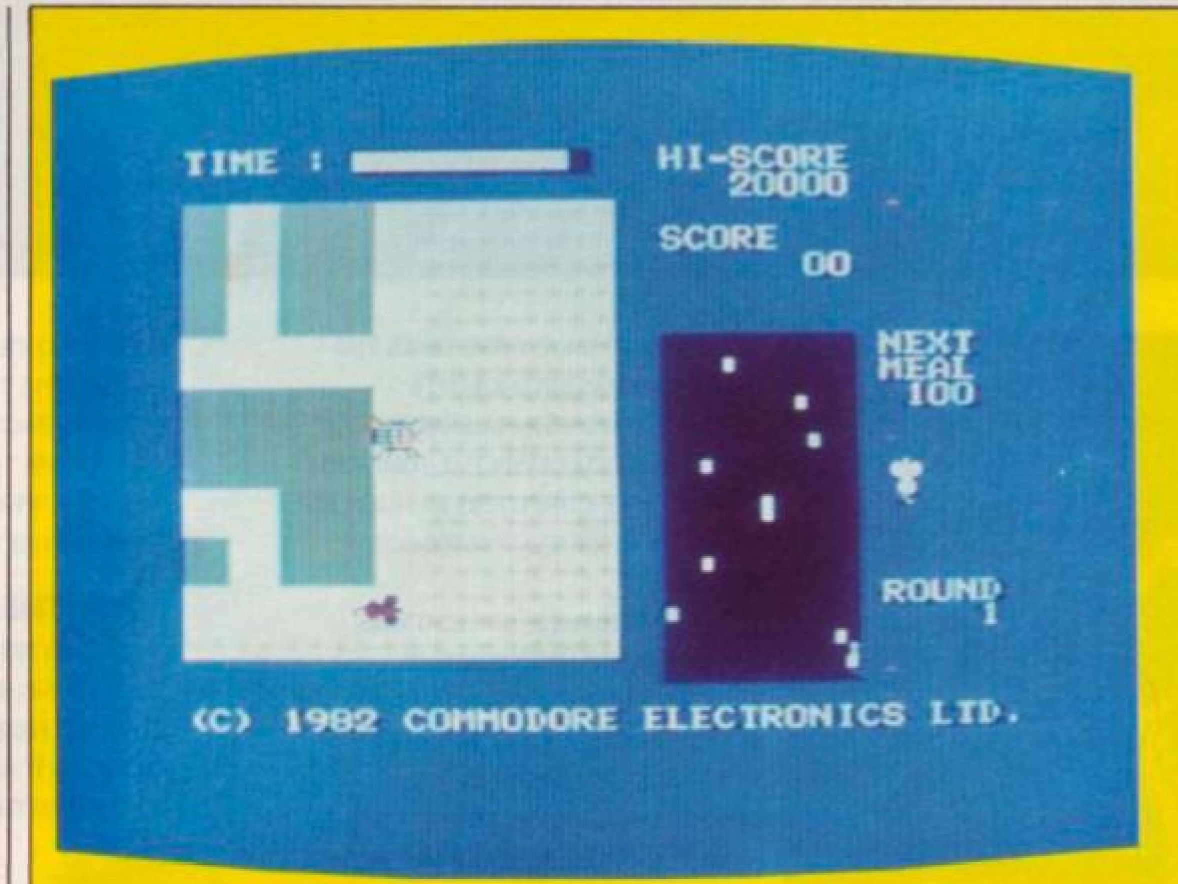
As you run away from Jim — or Alf or the others whose mowers you expropriate — you must be careful not to plough through a flower-bed; should you do so you will bring an angry gardener onto the scene and this makes your job all the more difficult.

Hovver Bovver's graphics are excellent but it is the sound that particularly impresses; barking, snapping, screaming and mowing are all cleverly imitated while in the background a manic version of "In an English Country Garden" remorselessly grinds away. This clever game features 16 different lawns, one of them with a llama-shaped flower-bed.

This strange obsession with llamas surfaces again in a Llamasoft game for the unexpanded Vic-20. This is an entry for the longest computer-game title of all time competition; Metagalactic Llamas Battle At The Edge Of Time — hereinafter referred to as Battle.

The extraordinary blurb rivals Quicksilva for absurdity; in the struggle against the evil empires of Irata and Zzyax only the "cerebrally-enhanced llamas" are holding out at the "edge of time". Their opponents are "cyborg arachnid mutants" — spiders to you and me. The spiders descend on strings while the llamas spit at them. Should a spider reach the ground it will turn into a "disgusting weeviloid".

If you move the force-field up and down "expectoration may be aimed at many parts of the screen from a static llama". Make no mistake, these beasts can really squirt it out and the game is very fast and quite exciting; it is certainly good value for the unexpanded Vic. After the shoot'em-up it's the age of the spit'em-up game.



CBM-64/VIC-20 SOFTWARE

Pete Connors mows the lawn, battles with the CBM-64's Bits, helps Dicky the owl recover his diamonds, rescues Fay Wraye and puts England into the World Cup final — all from the comfort of his armchair.

There is no spitting yet from Virgin though. It has four new games out; Bitmania and Falcon Patrol for the CBM-64, Envahi and Creepers for the Vic-20. With Creepers Virgin seems, at last, to have produced a winner. The game induced in me some of the excitement and compulsion that Space Invaders once had.

It is essentially a very simple idea. At the top of the screen are the aliens who bounce up and down stealing your energy supplies at the bottom. Your ship is to the left of the screen and can move only up or down, thus making it harder to hit the aliens farther away. When an alien has collected five of your energy units it mutates into a vicious green projectile which comes weaving after you.

At the start the game seems a little bland, even dull, but as the aliens get more frenzied it really does become compulsive. The nerve-jangling sound effects enhance the appeal, as do the crisp and uncomplicated graphics.

Envahi is an interesting idea, but rather dull in the execution. You have a helicopter with which you must protect a city, and the dam which towers over it, from invasion. If the alien munchers get through the dam wall is eaten and the city is deluged. Other invaders, preferring terra firma, make straight for the city.

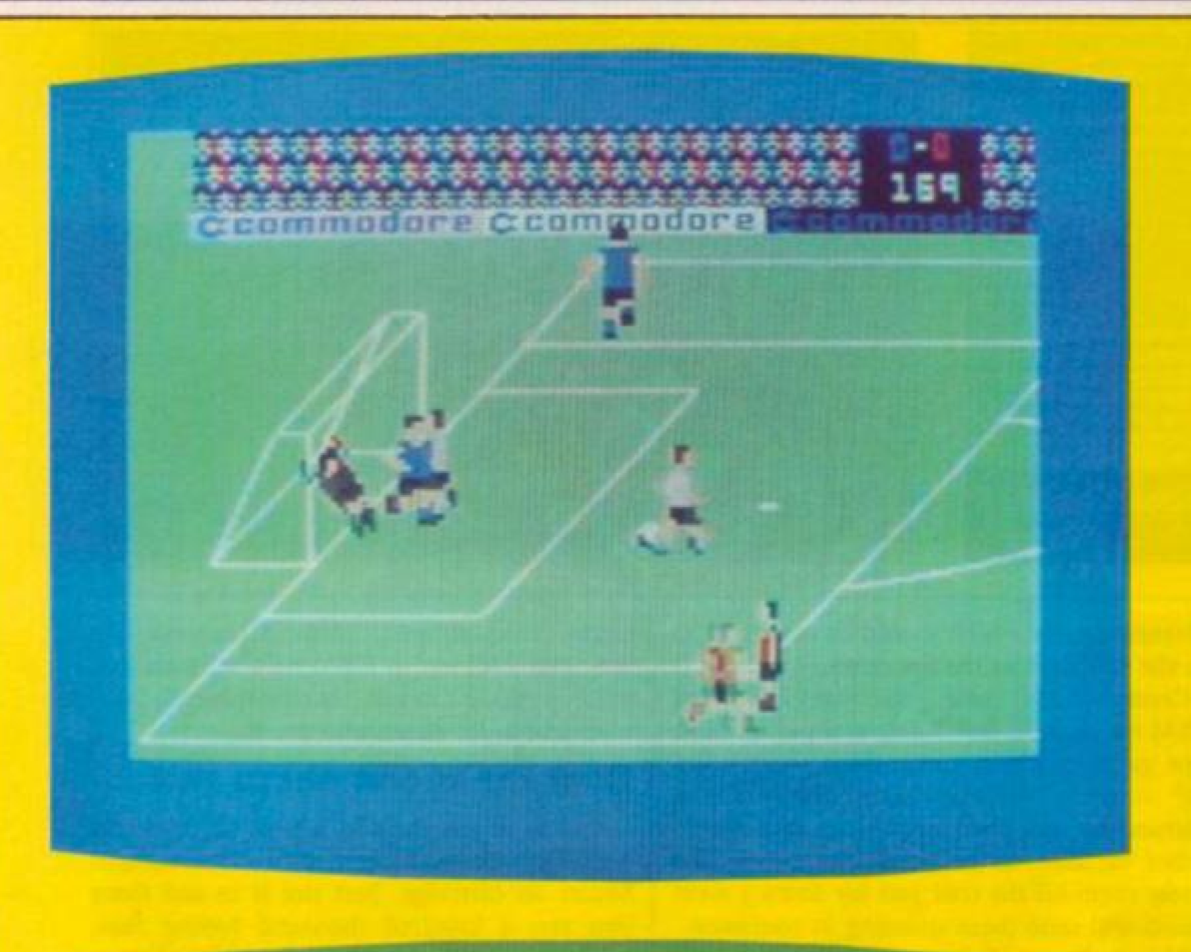
There is not quite enough going on or enough graphic interest to make Envahi a gripping game. Fed up with the helicopter? Then why not take the VTOL fighter for a spin? As in Falcon Patrol, where you have to protect your ground installations from attack by enemy aeroplanes.

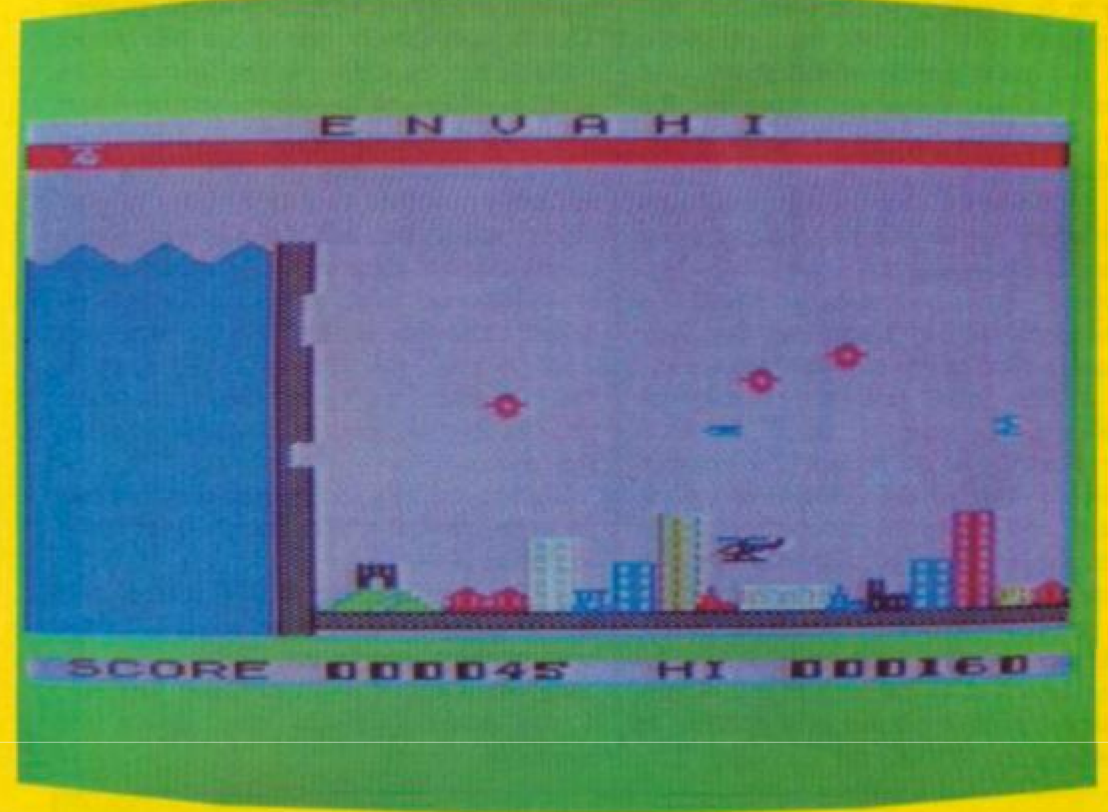
You have 100 missiles and a Defender-style radar at the bottom of the screen. Periodically you must do a vertical landing in order to re-fuel, a trick I never perfected as the enemy always comes at you just as you settle. The graphics in this game are good but the landscape is a trifle monotonous — palms, sand and flat-topped buildings. Falcon Patrol, though, is an enjoyable version of a familiar game.

At the heart of the micro

In Bitmania "you are inside a data-bus within the 64 and battling against the neuron flow". You must reach the central core, defending yourself against the CPUs armies of Bits. These are opponents looking like baubles falling off a Christmas tree. Bitmania features Centipede-like mutations and obstacles and is a colourful game, though its sound effects are feeble.

Imagine's Bewitched is a maze-type game although you would not realise it from reading the ridiculous blurb with its talk of death,





Top left: Rat Race from Commodore. Top right: International Soccer from Commodore
Above: Envahi from Virgin Software.

dungeons and famine. You have keys of different colours which you must match with a door of the same colour in order to escape, meanwhile avoiding the ghosts who resemble purple tadpoles. Those who like maze games could find Bewitched, for the unexpanded Vic-20, worth an investigation.

The need to see what lies on the next screen is one that all games players must have experienced. Zorgon's Kingdom from Romik, for the 8K or 16K Vic, is a program which uses this need to the full. I will not attempt to convey the anguish I felt when I realised that to see screen two I had to get my man to the top of screen one not just once but two times.

Zorgon's Kingdom has five screens through which you must endure similar agonies of frustration. The first screen has ladders, walls, holes and rolling bombs; it is a mixture of Monsters and Krazy Kong. Screen two goes on to ropes, lifts and mutating octopi. And so on. The graphics are interesting but not particularly exciting, yet the game has an appeal which makes it fun to play.

Romik's Atom Smasher, for the unexpanded Vic, is Centipede for the nuclear age; you are in a "runaway nuclear reactor" and must shoot the protons building up around the central core. It is a fast and noisy game which I found difficult to control with joystick or keys. Melt-down was rapid.

Diamonds are traditionally a girl's best friend, but in an entertaining and witty game from Romik for the CBM-64 we see an owl and a spider battling for possession of the sparkling gems. Stephen the spider has stolen Dicky the owl's diamonds, and he does not want to give them back.

Stephen, in fact, is a curious spider since he seems to have only half the normal complement of legs. However, this does not prevent him from spinning a tricky web which Dicky has to penetrate to retrieve his rocks. Dicky's task is difficult and requires the player to have quick reflexes and use logical skills and to find the best way through the web.

If you are not a very wise owl, Stephen will come and poison you. Thank God I did not meet his pal Cecil who appears on later pages. The moral of Dicky's Diamonds seems to be that you should never trust an arachnid with your jewellery.

Behold the Pac-Man

Zappy Zooks, also from Romik for the CBM-64, is disappointing in comparison. It is a dull Pac-Man-style game with an uninteresting maze and fuzzy graphics.

Audiogenic's A Country Garden for the 8K Vic-20 takes us back to summer pastimes. It seems that the "future of English horticulture depends on you" as various mutant pests ravage your carefully tended garden. The game is, in fact, a good version of Centipede, very fast and with clear graphics. If mass murder is one of your hobbies, then this game will appeal to you.

Amok, for the unexpanded Vic from Audiogenic, is a rudimentary game in which your little man must shoot or avoid the nasty green robots who have gone berserk. It is not the most exciting of games, but if you haven't got any extra RAM, what can you expect?

Anirog has three new games for the CBM-64; Skramble, Kong and Hexpert. The first has all the usual features; the rugged landscape, the cavern, with yo-yos, the firstballs and skyscrapers. The graphics are well up to standard and the sound is very good, especially when your ship is blown up, but sadly the game is terribly slow.

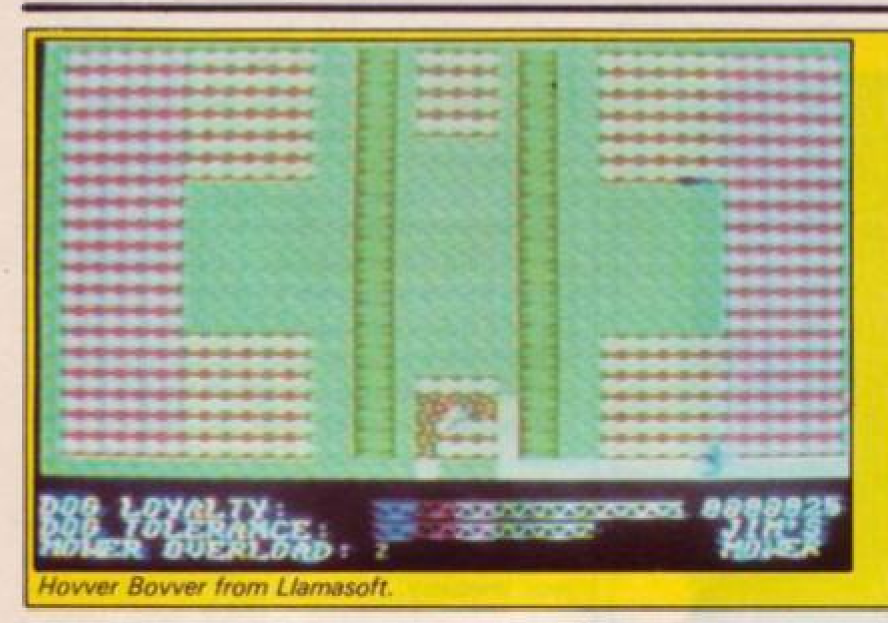
Kong, too, is a familiar game. To Rescue Fay Wraye from the nasty gorilla you must climb to the top of the screen avoiding barrels and monsters. Later screens offer lifts, girders and conveyor belts. Your brave little man is a funny creature with a long wobbling nose like an anteater's proboscis. This is an adequate version of an old favourite.

Hexpert is not nearly so effective. Here your man Bert must paint each block of a 3D pyramid made of hexagons, avoiding the rubber balls and Coily the snake. The graphics are rather ghostly and Bert is sometimes hard to spot in this dull game.

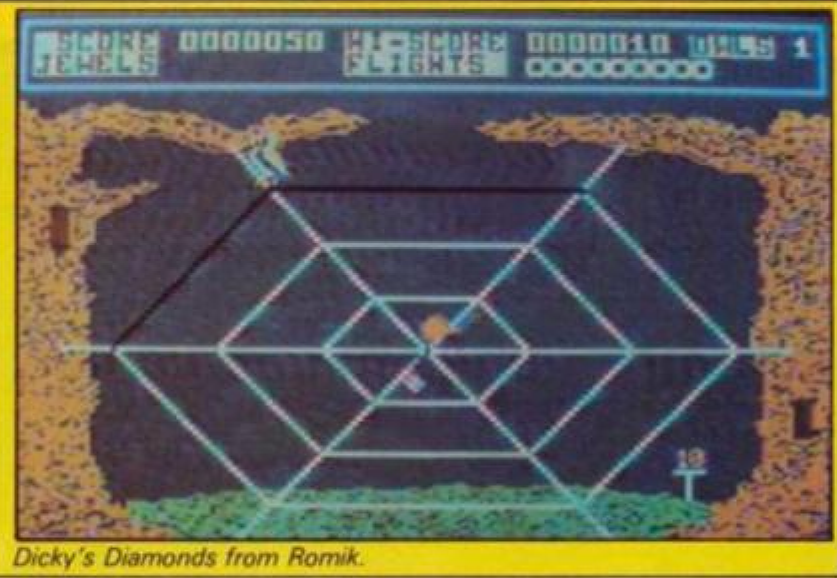
Quintic Warrior for the CBM-64 is from Quicksilva and, of course, comes with a silly blurb, this time about the sixth sense, sinister crabmen and mangled mutants. The game itself is similar to Gridrunner. Mutants rise from the bottom of the screen and must be zapped. Along the sides are two lasers; if you are caught in their fire, then the game is up. Quintic Warrior is an enjoyable fast game despite the ordinary graphics and weak sound.

From AVS comes a flight simulator for the unexpanded Vic, Flight Zero-One-Five. The

(continued on next page)



Hovver Bovver from Llamasoft.



Dicky's Diamonds from Romik.

(continued from previous page)

program requires lots of information to be keyed in and, therefore, lots of keys to be used. It lacks a good display of the horizon and does not seem to be worth the time it takes to really master the controls.

The road goes ever on

The Hobbit is one of the all-time best-sellers for the Spectrum, and now Melbourne House has produced a version for the CBM-64. Not surprisingly, it is virtually identical to the original. Based on Tolkien's famous book, the Hobbit allows you to assume the role of the diminutive, but charming, Bilbo Baggins. Your task, while looking after Thorin the dwarf, is to find the evil dragon and recapture the stolen treasure. En route you will encounter opposition — the evil Gollum, trolls and suchlike.

Help might be available from the magician Gandalf, though you must be careful as he is a testy old wizard.

Each different location in the adventure has its own clean graphic representation. Melbourne House claims that characters in The Hobbit interact with each other and, therefore, that no two games are the same. I never got far enough to really test this claim. Commands can be entered with more flexibility than is usual in adventures, due to what Melbourne calls "Inglish".

If you want to succeed it does help to have read the book. The Hobbit is a superior adventure game which should be as successful on the CBM-64 as the Spectrum.

Commodore's new cartridges for the CBM-64 include Rat Race, a superior maze type game in which your mouse — or is it a rat? — must find the cheese. He or she is pursued by nasty red opponents who would rather eat him, or her, than the cheese. To throw them off the trail you lay down a scent which will send them spinning in confusion.

Also to be avoided are the black cats who smugly block your path. At the right of the screen is a radar display which shows your position relative to cheese and opponents. Rat Race's graphics are good and the game is very enjoyable.

The CBM-64's sound facilities are acknowledged to be the best among home computers. Surpassing even the BBC. This difference can be clearly heard in Commodore's Music Composer cartridge. The sample tune can be altered to feature any three of the nine instruments that are available. As the tune is played the notes appear on staves on the screen. The program will allow you to use the CBM-64 as a piano keyboard, again with the notes appearing as you play them. Creative users will want to compose, and this is one of the main purposes of the program.

Unfortunately, you must enter a tune by pressing keys A to G, rather than just playing it in on the piano keyboard as is possible on Quicksilva's MU-PROC for the BBC. This slight criticism apart, Music Composer is a welcome addition to CBM-64's software and will provide much entertainment, and instruction, for those who use it.

Over the moon about this

And so to the choicest morsel on offer this Yuletide, Commodore's own International Soccer on cartridge. Just slot it in and there you are; a hundred thousand baying fans, luscious green turf, supremely skilful players. This is undoubtedly one of the best games available for the CBM-64; the sophistication of the graphics and the control you have over your players are remarkable.

You manoeuvre only one player at a time but when you pass control switches to your player nearest the ball. So you can play a robust long ball game as if you have a soupcon of continental flair, one-touch football of delicacy and finesse. Either way, when you score a goal the joy of the players is heartwarming. They bounce back to the centre circle in slow motion jubilation, Match of the Day style.

Goalkeepers, too, are impressive as they leap for a stinging shot or dive bravely at the feet of oncoming forwards.

International Soccer gives 100 percent over the full ninety minutes, Brian, and is by far the best speaking simulation available for the home computer. It is a two player game or, if you prefer, you can play against the computer.

Company	Program	Price
Anirog Computers, 8 High Street, Horley, Surrey.	Skramble (CBM-64) Kong (CBM-64) Hexpert (CBM-64)	£7.95 £7.95 £7.95
Audiogenic Ltd, P.O. Box 88, Reading, Berks.	A Country Garden (Vic-20) Amok (Vic-20)	
Commodore, 675 Ajax Avenue, Trading Estate, Slough, Berkshire, SL1 4BG.	International Soccer	£15 or less
Imagine, Imagine House, 5 Sir Thomas Street, Liverpool, Merseyside.	Frantic (Vic-20) Bewitched	£5.50

Company	Program	Price
Llamasoft, 49 Mount Pleasant, Tadley, Hants.	Hovver Bovver (CBM-64) Metagalactic Llamas	£7.50 £5.50
Quicksilva, Palmeston Park House, 15 Palmeston Road, Southampton.	Quintic Warrior (CBM-64)	£7.95
Romik, 272 Argyle Avenue, Slough, Berks.	Dicky's Diamonds (CBM-64) Zappy Zooks (CBM-64) Zorgons Kingdom (Vic-20) Atom Smasher (Vic-20)	£6.99 £6.99 £6.99 £6.99
Virgin Software, 61/63 Portobello Road, London, W11.	Bitmania (CBM-64) Falcon Patrol (CBM-64) Envahi (Vic-20) Creepers (Vic-20)	£6.95 £7.95 £6.95 £5.95 £5.95

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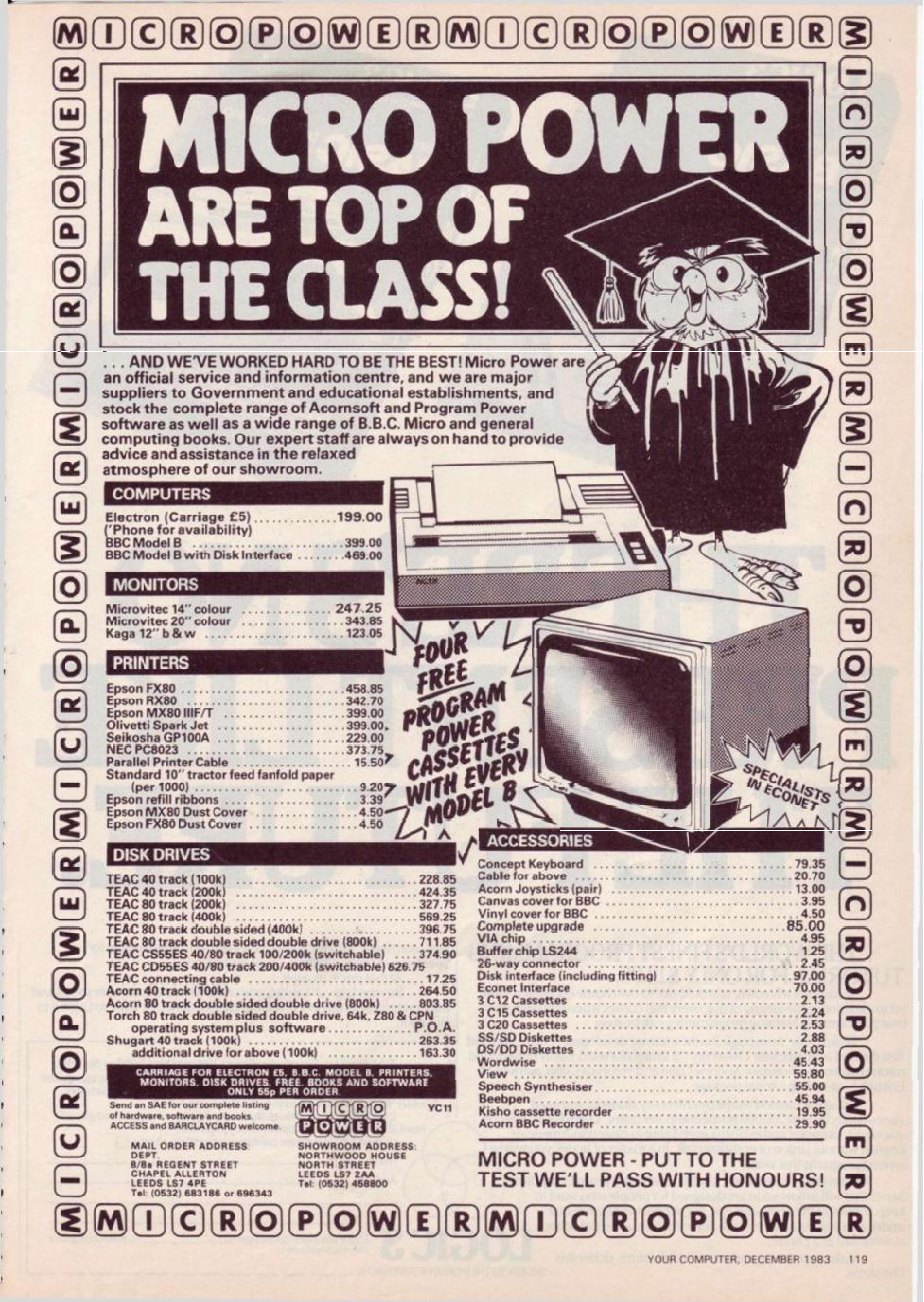
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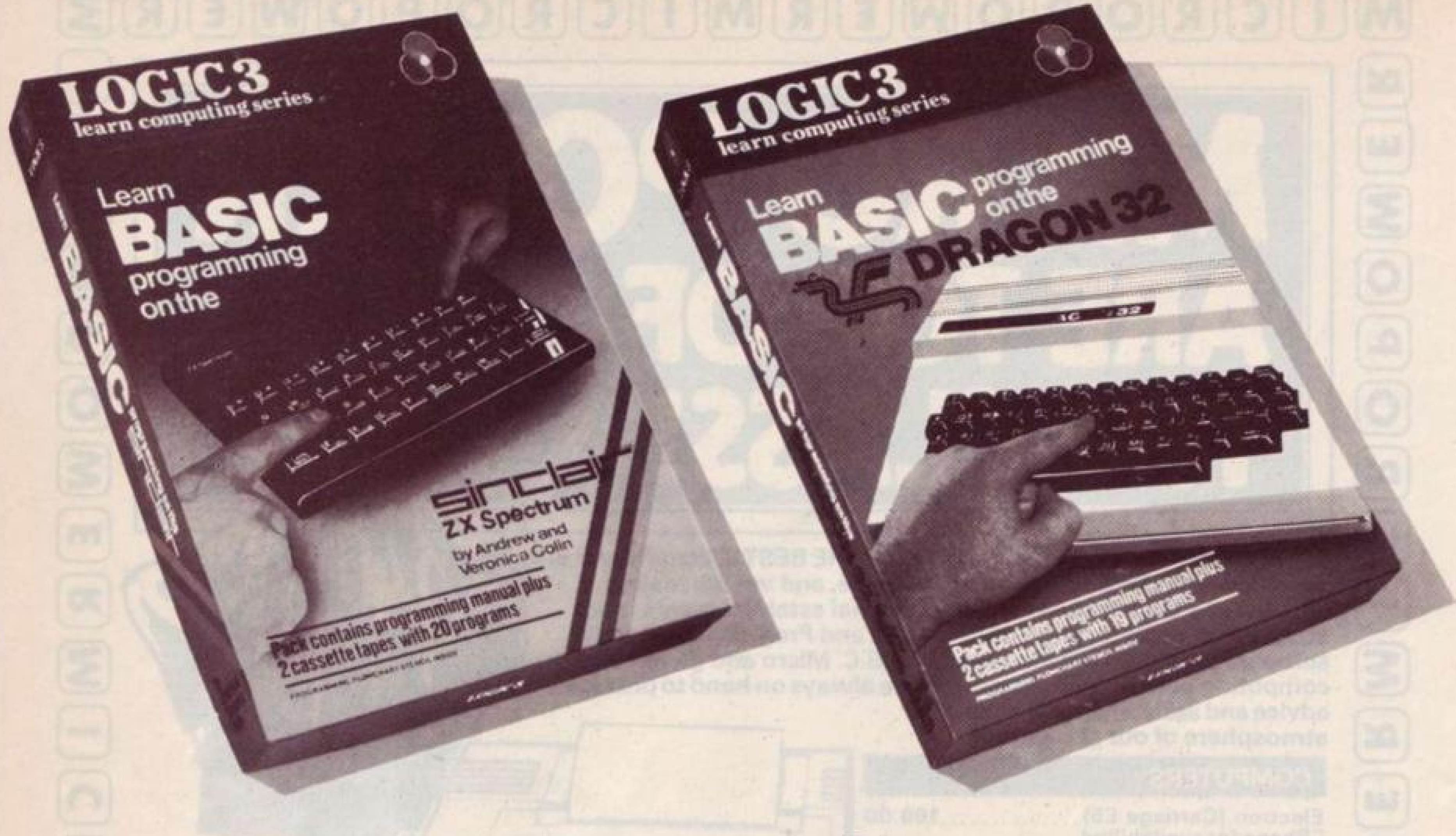
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TEAC 80 track (400k) 569.25
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THE WORLD'S FINEST PROGRAMMING TUTORIAL FOR ONLY £12.95.

Thousands who own, or would like to own home computers have yet to experience the feeling of discovery that comes when you write your own programs. Yet learning programming can be easy.

'Learn Basic' from Logic 3 is the ultimate development of the method first devised at Strathclyde University – a straightforward, easily understood tutorial written by Professor Andrew Colin and Veronica Colin, authors of Britain's best-selling tutorial package.

Using the method tested by university students and used successfully by over 200,000 home computer users, 'Learn Basic' runs on your own computer and explains everything in clear non-American English without jargon or computertalk. *In a matter of hours, you will be writing programs that work.*

Essentially, 'Learn Basic' and the rest of the 'Learn Computing' Series that will follow soon are designed for people who want to keep abreast of the computer age. For people who realise that understanding computers is the key to future success, at school, at work and as a parent.

Make your future, and your family's future, richer this Christmas.

Get 'Learn Basic' by Logic 3 – two tapes and a full-size manual for Spectrum or Dragon (others soon) at just £12.95.

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Buy the Logic 3 'Learn Computing' Series at computer shops and major retail stores all over Britain. In case of difficulty, write to Logic 3 in Windsor.

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If you would like to know more about using and programming a computer in your home, send this coupon for your free copy of our 16-page explanatory booklet "100 things you wanted to know about computers."

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Name________

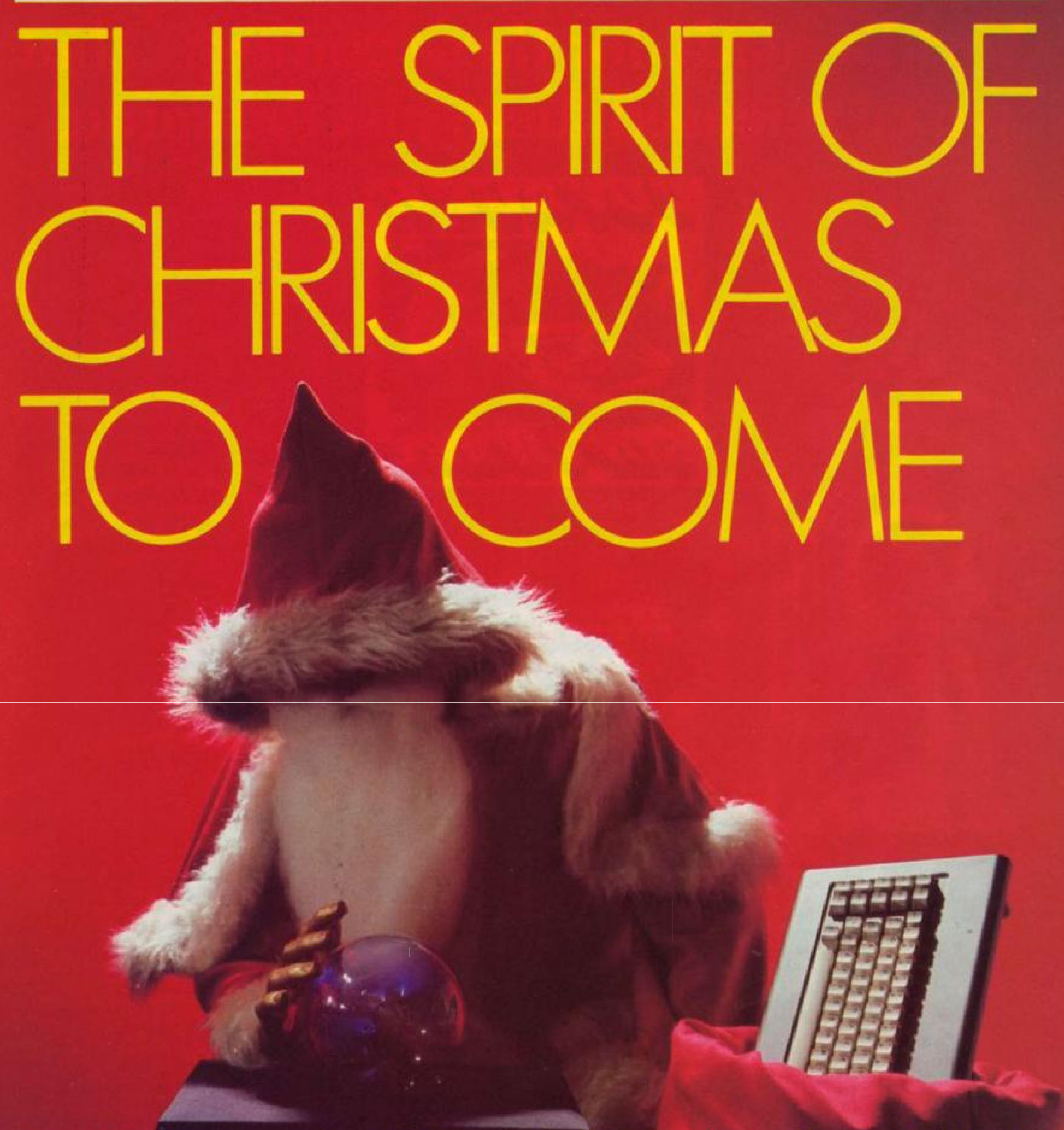
Address________

I have already/intend to get a________ microcomputer (delete as inapplicable)

LOGIC 3

– THE KEY TO THE WORLD OF TOMORROW.

THE SPIRIT OF CHRISTMAS TO COME



A STRIKING microcomputer industry trend in 1983 was the continuing fall in retail prices. Traditionally Christmas is the time for the biggest price cuts, but since prices have been dropping ever since micros appeared, how much longer and how much further can they go? In the video cassette recorder market, by comparison, prices have already stabilised, and will probably increase slightly, but with accompanying improvements in facilities.

Most computer companies will be looking for record sales this Christmas, and an increased market share. But quantity commitments to factories are usually needed almost 12 months ahead. In other words, by the end of January this year, the major retailers had already decided how many machines they could sell this Christmas.

After deciding the right quantity, they just have to sit back and wait. By August, some forecasts can be reviewed, but it is already too late to change the numbers; by now the factories have already made the majority, and have bought parts for the rest.

The sales potential of any home microcomputer is inversely proportional to the price. By September, the Christmas selling prices must be determined. Brave — or blinkered — companies stick to the regular price; nervous ones start hacking the regular price down. Provided the dealers now buy all the manufacturer's stock everyone's happy. If they do not, some drastic steps are needed. First off, the high-turnover operations are approached; people like Boots, WH Smith and other multiple chains will often respond to discount offers. The second step is to beef up the advertising campaign. The fastest reacting method is TV, but the price has to be paid, and £250,000 does not go too far these days.

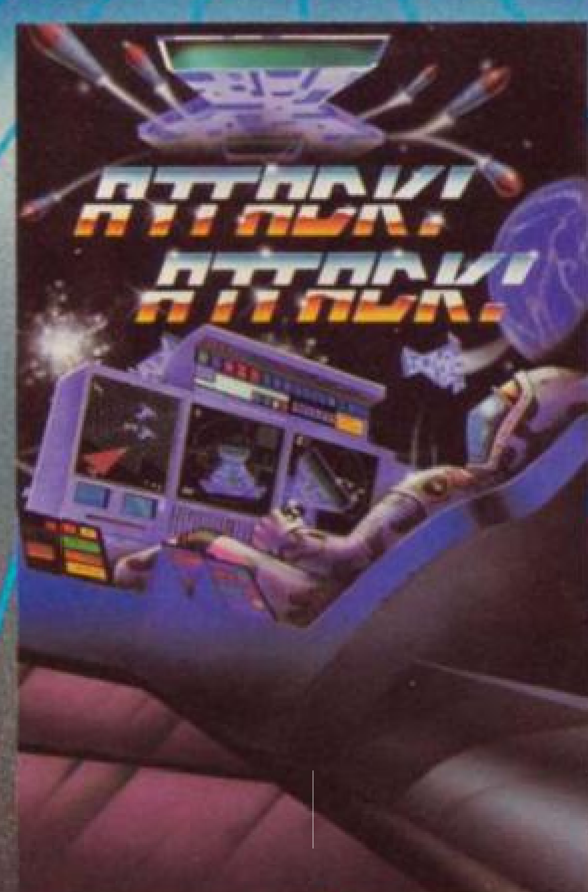
Commodore U.K. reckons it is heading for 35 per cent of the British market this Christmas, and has projected over £7 million on advertising/PR to achieve it. With a market estimated at £500 million, Commodore targets retail sales at over £150million, with about 5 percent going to the advertising campaign. In practice when dealer discounts are considered, actual sales are nearer £100 million, and the advertising portion is relatively higher.

(continued on page 123)

We're not quite sure whether the World's ready for these games . . . but we've released them just the same.









The Marcon Empire [illegible] enslaved the population. [illegible] of stellafreighters [illegible] mineral wealth [illegible] of the planet.

A small band of freedom fighters [illegible] operating from an abandoned [illegible] on the Moon; one of them is you. As you [illegible] from your secret base your first objective is to manoeuvre through the barrier of lethal space mines to one of the enemy [illegible] charging stations to re-charge your [illegible] lasers; then you will be able to carry on with your mission of destroying the marauding stellafreighters. There is rumour of a Marcon munition station near by, heavily defended by missiles. If only you could locate and plunder it; your heroic band of avengers would then have enough fire power to strike a massive blow for freedom . . . or die in the attempt. Avenger is for the Dragon 32.

Tension mounts as your [illegible] the patrol area. Enemy Skyfreight [illegible] are increasing as their need for freedom grows in the arms race against you. Your raydon missile sight picks up an enemy convoy entering your quadrant. You select hyperdrive and are slammed back in your seat. Fingers hover over firing buttons as enemy fighters peel away from the convoy to engage you. As your epic battle begins the enemy Skyfreighters unleash wave after wave of air to air missiles against you. The battle rages on and your will to survive and determination to win increases. The convoy must be destroyed; your people are depending on you. Night falls and glaring explosions fill the sky; don't let your concentration wander, if the convoy gets through your people are doomed, you must succeed, you must. . . Attack Attack is for the Commodore 64.

Your mission: destroy the [illegible] rocket base on the planet Hagon. [illegible] The Hagon fleet have been alerted and wave after wave of Astrafighters come hurtling toward you. As you battle your way to the end of the tunnel you begin to realise just how [illegible] this mission could be. Zooming through Hagon's defensive asteroid belt your concentration intensifies; you have only a fraction of a second to differentiate between asteroids, space mines and Etron rockets as they flash toward you. Hugging the planet's surface, dodging defence poles and trying to deal with everything else the Hagon's throw at you, you remind yourself that the fate of an entire galaxy rests on the outcome of your mission, you must succeed . . . Quasar is for the Commodore 64.

Please supply the following games:

	No. of copies	
Avenger	☐	I enclose a cheque/ P.O. payable to: Voyager Software
Quasar	☐	
Attack Attack	☐	for £............

Name ....

Address ....

....

Voyager Software, Business Centre, Claughton Road, Birkenhead, Merseyside, L41 6ES. Tel: 051-647 8616.

Any of these games for just

£5.99 each including a lifetime guarantee and dispatch back to you by return of post

Trade enquiries welcome, ring Roy Butler on 051-647 8616 NOW!!

Voyager Software, Business Centre, Claughton Road, Birkenhead, Merseyside, L41 6ES. Telephone: 051-647 8616.

(continued from page 121)

Anyway, by Christmas Eve it is all over and some manufacturers should live to see another year. For many this price war will be the last, and not enough fat will have been stored away to see them through the lean months. The casualties can usually read the writing on the wall by mid-November, but will still go down fighting.

There have already been some signs as to how :ough the fight will be; Dragon Data has recently raised £2.5 million, reducing, Mettoy, the parent company's stakes, to around 8 percent. How many more hard times can they survive?

Once this Christmas is out of the way, we can all look forward to next. I will try a few predictions, but in this business any form of forecasting is usually inaccurate.

For Christmas 1984 many of this year's micros could be half-price. The Commodore 64 could be £99.95, the Tandy Colour around the £100 mark. Sinclair's Spectrum will not reduce much, say to £69.95, with Oric following. The BBC Model B must have some price cuts, though I am surprised it has held for so long. While the big school purchases are still there, maybe it will stay at £399. Who knows? What of the Electron? It ought to share its big brother's success, although the investors seemed cautious when Acorn's share issue was undersubscribed.

Many computers introduced

Many of this year's favourite computers will continue through to next year, but numerous others will be introduced for next Christmas. However many new micros are launched, there is sure to be another offering from Sir Clive. What will it be? Oft has the Sinclair Business Computer been suggested, but unless the price-point is right, he has little chance of churning out the tens of thousands needed to ensure success. Business users do not buy mail order, or wait months for delivery. The actual specification of the business machine is still not officially released, although many have published their predictions. If it is to be aimed primarily at the business market, it must include disc drives and a monitor as standard.

Even Sir Clive did not rate his new flat-screen TV as a computer monitor. Unless colour is required, liquid crystal displays have a number of advantages over the flat screen, but no doubt Sinclair can reverse this status. For disc drives is he thinking of the Spectrum Microdrives? If he wants a 16-bit micro to compete witht he IBM-PC, he will have to use more conventional drives like the Sony 3.5 inch units. For the home market, the Spectrum could be upgraded to include the cartridge and joysticks option as standard, with probably 64K of RAM.

Many of the existing micros wil see a new lease of life with some of the latest peripherals coming next year. One of the most interesting from the enthusiast's point of view will be the micro-disc drive, although prices and capacities of the 5.25 inch drive will improve. I would still favour the regular mini-disc drive for a couple of years yet, although by then the "micro-Winchester" may be the norm. A combination 3.5 inch fixed hard drive and floppy microdisc seems like an ideal combination for the business machine.

Some machines will be expanding their RAM complement as the 64K-bit chips become cheaper. Surprisingly there is a shortage of many types of integrated circuit right now, with a potential supply crisis early next year. In the long term the situation will improve, but until then, most chips will hold their price, which will keep manufacturing costs up slightly, and encourage some designs into custom chips rather than standard components.

One market sure to expand in the next year is portable computers. This year saw the introductuion of the Tandy Model 100, a revolutionary device with its built-in software and 40-character-by-eight-line liquid crystal display, and all working off four penlight batteries.

A number of other manufacturers will follow Tandy's lead, with other devices from the same stable and surely prices will fall. The liquid crystal displays will become larger and cheaper, maybe up to a full screen size of 80 by 24. This type of product is exactly what the Japanese manufacturers need. Taking existing technologies and making it cheaper, smaller and more reliable is their forté.

The factory where the Tandy Model 100 is made is one of the most up-to-date in Japan, with almost total automation. Small unmanned trolleys move components and finished items around the factory by sensing wires in the floor. All the components are automatically inserted, and then solder-dipped, before being 100 percent tested. Further stages of manufacture are totally automatic, leaving the employees to do only jobs robots can not do — yet. Nearly 300 staff produce the equivalent of five computers each per day.

Telecom Gold Service

The liberalisation of British Telecom might help promote the underutilised communications capabilities of modern micro-computers. The introduction of the Telecom Gold service will give the business user freedom and security in setting up a system, and the private user a chance to use a nation-wide network for the cost of a local call and minimal rental for his mailbox.

Telecom Gold is a service offering the basis of a sophisticated electronic mail network, for very moderate cost, and allowing various levels of communication outside the user's network.

Each user is allocated a user identification — ID — password. To log in, the user calls a local number, and an auto-answer Modem answers. When the carrier tone is heard, the user switches to data, or inserts the telephone handset into the acoustic coupler. From now on it is all keyboard stuff; after entering the ID and password, the system prompts if any mail has been received since the last log on.

"Mail" is messages sent from one user to another, or from one user to a whole group. Each message is time and date stamped, and can be coded for "acknowledge receipt" or "reply requested". After mail has been read and answered, it can be either deleted or stored appropriately. Many other features are available, but this is the basic concept.



All that is required to use an electronic mail system is a computer and an acoustic coupler; a device that usually connects to the computer's RS-232C port and fits into the phone handset, so that tones produced by the coupler can be transmitted down the lines. Unlike the acoustic coupler, the direct-connect Modem actually links on to the telephone wires, and can also offer auto-dialling and auto answer.

These Modems, with the auto-dialling and auto-answer facilities will soon be sold for around £100. In fact, if the Japanese were allowed a chance they could be £29.95. There is nothing inside a Modem to make it £400, it is just quantity production that is required.

An unpublicised set of conditions for BT — British Telecom — approval of integral Modems — actually it is BABT not BT, but same controls — means that after a sample has been technically approved in the UK, BABT has to send one of its engineers to inspect the supplier's factory. If this happens to be in Japan, the cost can be quite extortionate. Considering the high-quality standards of manufacture in Japan, they do not have any problems convincing the BABT safari man!

Over the past few years various types of alternate input device have been introduced, but none is a real threat to the Qwerty keyboard. There have been bid pads; a type of writing pad that can decode characters written on it, the Microwriter; a one handed keyboard which uses combinations of five keys strategically located under each digit, and the latest one to crawl out of the skirting board; the mouse.

Mouse on the way out?

None of these devices has been particularly successful, so why should the mouse be any different? Who is likely to pay around £6,000 for the Apple Lisa and use only the mouse? It is far easier to press one key to indicate the desired function, then it is to locate it with the mouse. On a cheaper machine which could justify its price for one unskilled user, maybe the mouse has a valid purpose, but I believe after a short while the mouse user would prefer to learn to type. The mouse cannot be used to enter strings of text so the user must resort to the keyboard for word processing anyway. I think that the mouse will become extinct in 1984, but what new gimmick will replace it, who knows?

For some time now, there has been talk of standards for hardware specification of home

(continued on page 125)

£1000 TO BE WON!



SEARCH FOR THE UNIVERSE'S WHIZ KID & VID WHIZ

Softek are scanning the known Universe for the greatest Whiz's, both at programming a popular micro and acheiving the highest scores ever on a Softek game.

ARE YOU THE GREATEST WHIZ KID?

Rumour has it that this Universe's greatest programmer resides on planet SOL 3, sometimes known as "Earth". Can you prove that it's true? Between now and Dateline 31.12.1983 A.D. Softek are hunting for this planet's greatest. If that's you then send us proof! We'll consider any evidence of your supreme ability! Send that brilliant new program you've been working on, or the groundwork of it (which of course still shows its greatness quite clearly!). Softek will guarantee you 100% ASSURANCE that your copyright will be observed and confidence maintained. In January we will announce in the Micro-press who the Softek Whizz Kid is. If it's you then you can expect to be signed up by Softek to publish your wonder works. Even if it is not you, then there's a chance that you'll be offered a contract to write for Softek anyway - incorporating the highest royalties of any Software house together with worldwide distribution which is second to none!

The Softek Whiz Kid will receive £1000 of equipment or software of his/her choice!

ARE YOU THE GREATEST SOFTEK VID WHIZ?

We are also on the hunt for the Galaxy's greatest players of Softek games. Have you got the highest score on a Softek game? Up to Dateline 31.12.1983 we'll be keeping track of the scores you send in and if you've got the highest score on a Softek game then we'll publish your name in the New Year's Micro-mags and you'll get a complete range of Softek Software too!

SEND YOUR ENTRIES TO:

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Softek reserve the right to determine that submissions to the Whiz Kid competition fail to meet a minimum quality, in which case the competition will be voided. The judges decision is final. The above competitions are not open to employees of Softek International Ltd. or any under contract to them. No correspondence shall be entered into regarding the results of the competition.

(continued from page 123)
computers, giving the opportunity for software compatibility between different manufacturers' machines. Some may doubt the advantages for such a move; any constraints on the specification of a new model to ensure compatibility with the standard could mean that the new machine has no advantages over its predecessor, except perhaps on price.

But do we only want cheaper computers? It stands to reason that any form of standard to be introduced by the big manufacturers will have to be flexible enough to allow unfettered evolution, but retain a common core to use the software developed *en masse* for the whole range. If the standards concept is thrown out of the window — which I feel is unlikely — the format of the next generation of micro computers will go the way the strongest muscle decides. By muscle I mean manufacturer's muscle, not consumers' muscle. The consumer has a track record of trading machine performance for value for money, and often ignoring value for money in favour of lowest price.

In the business end of the marketplace, we have already seen the might of IBM enter the ring with its personal computer.

Nobody invited IBM. No. They simply put millions of dollars into developing a new 16-bit micro, sought the co-operation of software giants like Microsoft, and then used their considerable marketing clout to launch the product.

When the machine was first announced, many declared the hardware specification too unconventional, and with a new species of operating system to overcome, the IBM was often dismissed as a non-runner. More like a one-horse race. IBM needed penetration of the marketplace, and software is the key in business computer marketing. Quantity production is the key to software marketing, so with promises of huge sales of the IBM PC, software houses could not afford the risk of missing out on this sector of the business.

But the race is still on. Now that so much software has been developed on the IBM and its MS-DOS operating system, — called PC-DOS on the IBM — other manufacturers are seeing the light and switching research and development funds to IBM look-a-likes. Even some of the biggest names in the business have conceded that they must marked an IBM-like machine in their range. But IBM must not wait around too long, either, now that others are on their bandwagon, and if they want to stay ahead of the rest, they will quickly move on to greater things and lead the industry to the next horizon.

New Japanese standard

On the personal computer front, and by "personal computer" I mean "home or enthusiast computer", there is a move afoot to settle a new Japanese standard known as MSX. The main point being to standardise the software and minimum hardware configuration so that there will be compatibility of software between many different home computers made by a range of manufacturers. This would suit the oriental producers because they could concentrate on churning out more and more micros at lower and lower costs. If lower costs mean lower shop prices, and software compatibility gives a huge range of packages, then what has the consumer to worry about?

We have welcomed standards in audio records and tapes; selecting the best and discarding the rest. Even though the 33 rpm record has been in use over 20 years, considerable technological improvement in both the "hardware" and "software" has been achieved without changing the basic configuration.

The consumer can still buy the *el cheapo* record player for a few pounds or spend a four-figure sum on high-fidelity stereo equipment. Until the compact digital disc arrived on the scene, the record was considered by most to be a suitable medium for their music.

When the compact cassette drove the eight-track cartridge out, few tears were shed. Many advancements have been seen since in cassette technology, for instance, Dolby noise reduction, chrome and metal tapes, without leaving the original hardware owners out in the cold, or incompatibility of the latest machines with the earliest tapes.

Some competition in standards can be a useful ally of the consumer, as has been seen in video cassette recorders, with the two main standards; Betamax from Sony, and VHS from JVC, Hitachi *et al.* Both systems have quickly evolved to a degree now that not much change in hardware configuration is expected in the next year or so.

If Japan succeeds with the MSX generation of microcomputers, what will we expect to see for next Christmas? Not all the big Japanese names are yet convinced about MSX, and two of the existing computer manufacturers, Casio and Sharp have decided to go their own ways. One of the first into the MSX arena will be Matsushita, followed closely by Sony. Also expected to join in are; NEC, Sanyo, Toshiba, Yamaha, Pioneer, JVC, Hitachi, Fujitsu and Mitsibishi. Retail prices for the MSX standard machines is projected to run from about £130 up to £300.

Surprisingly, the Japanese government is not supporting the MSX system, as it feels there is still room for technical innovation, and setting standards now will inhibit further advances.

Digital Research, founder of the world famous CP/M operating system for floppy-disc computers, has suggested to some of the Japanese manufacturers not already on the MSX road, a different set of standards, but keeping very quiet about it.

Some of the software products available for the home computer range are now so diverse, any form of standardisation of hardware must help to increase the software library for each machine. The greater compatibility of each program over a range of computers, the higher sales can be expected. As most of the cost of a program is in the initial development, the retail price of any package will be reduced when quantity sales can be realised. The pirate-to-legal copy ratio is inversely proportional to the selling price, so lower prices mean higher sales again. Unfortunately, the high number of illegal copies of any program encourages suppliers to distribute their software on ROMs. These cartridges have many advantages with their instant



loading and stability. More important, for many of the small memory micros, as a cartridge is memory itself, it needs less RAM to run a program. By not making the program relocatable, even if an unscrupulous user does manage to read the ROM, the code is unlikely to run in the RAM portion of the computer. Even using complicated colour graphics, some excellent cartridge programs can run in 16K RAM devices that would need 48K to be RAM-based. Until the standard memory of home microcomputers is up to 64K, cartridge programs will be an important medium for software distribution.

Europe in the lead

Business software suffers less from illegal copying; it often requires regular updating, and business users are less amenable to the cost savings of pirate copies against the support and assistance provided to *bona fide* users.

Europe has always lead the application software market. The Americans may have the upper hand in system software, with companies like Microsoft and Digital Research, and systems such as CP/M, MS-DOS and Unix to their claim, but it is in Europe and Britain in particular, that the application software expertise lies.

On the hardware side, considering that the U.K. is one of the major design centres of new computers in the world, we do not always seem to bring the innovative products to fruition, especially at the low end of the market. So often British companies develop systems, only for the financially rewarding production to end up overseas.

One new business computer to emerge this year was the Apricot from ACT, which will surely be one of the top sellers in 1984. With its IBM compatibility and new micro-disc drives, it bridges the gap between latest generation hardware and existing software, but leaving room for new programs that would use the full capabilities of the hardware.

To predict what the future generations will have to offer the user is difficult. There will have to be a point where the rate of technological advancement slows down but only for commercial reasons, and consolidation of the existing models is the main concern. The major manufacturers must all find their niche in the marketplace and develop it. There is no reason to believe that the computer industry will not develop as the motor industry has, but in a considerably shorter time. ■

THE FUTURE OF THE MICRO INDUSTRY

"WE WILL BE SELLING a very powerful computer with more than 256K of memory for less than $50 by 1986" predicts Commodore U.K. chief John Baxter confidently. But what of next year, what sort of machines and software can we expect and how much will we hve to pay for them?

Everyone agrees that you will be able to buy more performance for less money but there are disputes about which routes to take to get there. Firms like Sinclair and Atari are known to be working on 16-bit machines to eventually replace the eight-bit ones they are selling now

'We will be selling a computer with 256K bytes of memory by 1986'

and Acorn is even attempting to skip that stage and move straight form the eight-bit BBC Micro to the 16/32-bit Gluon unit.

Some software houses are confident that by next Christmas "16 bits are going to be standard" as Imagine's Bruce Everiss believes. On the other hand John Baxter thinks that "16 bits are irrelevant as far as home computers are concerned."

Elan director Robert Madge is so confident that eight-bit machines will still be to the fore that the high specification Elan Enterprise which will be launched in March is designed around the Z-80 chip. If the Japanese finally make the impact long predicted on the British computer scene it will be with Z-80 based machines sharing the MSX standard.

'16 bits are going to be standard'

Despite the fact that many British companies believe that MSX is a "low performance standard" as Robert Madge puts it the specification of some of the MSX machines recently unveiled in Tokyo is quite impressive.

The Japanese think that people are beginning to treat home computers a bit like hi-fi or televisions and so long as a unit produces reasonable sound and pictures and looks neat they do not care whether it contains state of the art electronics or not.

One trend among the Japanese machines is greater integration with other domestic appliances. The Sanyo NPC series micros for instance can connect up to a video recorder or television and take still pictures from there to use as the raw materials for computer manipulation on screen.

Yamaha has even incorporated the MSX specification into something which looks and behaves like a cross between an electronic organ and a home micro. But while the Japanese seem to think that the recipe for success in 1984 is to use a proven but old-fashioned design and then embroider it with gimmicks like built in light pens, and take

'Commodore never looks to the past'

John Baxter, marketing manager of Commodore U.K.



Meirion Jones corners some of the leading lights of the microcomputer industry and presses them for their views on possible developments both in hardware and software. How will the market change in the new year?

advantage of a potentially huge common software base to all MSX machines Robert Madge believes in greater sophistication.

He believes that the natural point to standardise will be when home computers have reached the limits of the other equipment you can find around the home. There is no point in making computers with better resolution than the average television unless you think people will go out and buy purpose built monitors. John Baxter thinks that falling computer prices will cut the costs of peripherals including monitors and, of course, disc drives.

He predicts a price of £120 for a good 64K computer this time next year with disc-drives costing £100 and full colour monitors also around £100.



Bruce Everiss, general manager of Imagine Software.

"Commodore never looks to the past," quips John Baxter, and indeed Commodore has a new home computer on the stocks for 1984 but first glimpse of that will not be until the American Consumer Electronic Show next year.

The failure of MSX or any other standard to establish itself internationally means that the traditional problem of the software industry — lack of portability between machines — will not be solved in 1984.

Whether games will be as important next year as they were this is a moot point. New programs like International Soccer for the Commodore 64 — reviewed in this issue — are taking computer games beyond the two-dimensional arcade and maze formats yet many people believe that games will decline in importance compared with educational and home control and planning software.

MSX: 'A low performance standard'

The Elan, for instance, will come with 80-column display and a built-in word processor. Bruce Everiss of Imagine believes that the market for games will at least double next year: "It's the mass market. Games playing is here to stay". At the same time he sees a narrowing of the gap between business and home micros which perhaps explains his enthusiasm for 16-bit computers with colour and sound.



Everiss expects to see the first million-seller program early in 1984. Although bubble memory and monster RAM chips are beginning to drop in price no-one expects to see them displacing disc drives as a means of mass storage for home computers by next Christmas. However, there seems general agreement that the drives themselves will be down to the £100 mark by then. Outside of Sinclair and Coleco there seems little enthusiasm for fast tape storage systems.

'We're going to get some viable competition from record companies'

John Baxter points out the rapid progress educational software has made this year "whoever thought you could sell Physics O level revision." A point echoed by Robert Madge who says that by next Christmas "homework will naturally be done on the computer". Although he still believes that "games will be dominant".

Everiss sees the in-house software companies — Sinclair, Acornsoft, Commodore continuing to do well but thinks that there will be a thinning out of the ranks of the smaller houses leaving a few big independents.

"In the long term" Everiss believes "we're going to get some viable competition from the big record companies." Among the hardware manufacturers everyone is expecting a shake out with some companies going to the wall or stopping making home computers.

After all the predictions that 1983 was going to be the year of the Modem there is bound to be some cynicism at predictions that by this time next year a lot of the Christmas cards will be sent by electronic mail. Nonetheless, Modems have now been completed for most of the major home computers and some companies like Oric and perhaps Sinclair are considering building them. ■

While shepherds watched the box one night, Andrew Bindon plugged in his BBC Micro.

XMAS CAROLS

THE PROGRAM LISTED plays 19 of my favourite Christmas carols in three-part harmony. At the same time it displays each note on to a normal musical score individually as the note is sounded. The clever part is that the program composes its own musical harmony to go together with the melody.

To understand how the auto-harmonisation works we must consider the way in which simplest musical harmony is composed. As an example let us use the key of G major. Using the common name-note notation together with pitch numbers this runs from octave to octave:

G	A	B	C	D	E	F#	G
81	89	97	101	109	117	125	129

If we start at any note on this scale and take three alternative notes we form a triad. Basic musical harmony uses three of these triads beginning on the first, the fourth and the fifth note of the scale. These are called the primary triads. For the key of G major they are:

G 81; B 97; D 109; C 101; E 117; G 129; D 109; F# 125; A 137.

We see that using these triads we have encompassed every note in the scale. The same chords will also map on to notes an octave away, or two octaves. These triads have a particularly pleasant musical sound. By selecting one of them to play with each note in the melody we can obtain an interesting and pleasant-sounding harmony backing.

The melody itself is read from data statements at the end of the program. These may be replaced in your preference. There is nothing new in reading data for music in this way but perhaps something which is new is the way in which the data is stored. Each of the single individual melodies are stored as three lines of data. The first line gives the number of rhythm units/bar, the position at which the bar is, the time signature, and the best way to display the music respectively.

The second line then gives the pitch of each note in the melody. The third line then gives the length of each note in the melody. All three lines are read at the start of a piece. The procedure Procdata then picks out the character from the data string and converts them to pitch and duration numbers.

In this way a great saving on space is obtained and also this opens up the way for future enhancement of the program.

The code for this data storage is d for Do up to t for Te in the first octave and then the same for the next but in capitals. The range could be extended if needed. The rhythm is c for crotchet and so on. Dotted notes are then represented with capitals. Both of these codes can be understood clearly by examining the relevant lines in the Procdata routine.

The data conversion process may be fully understood by typing in the following lines.

```
DtDRDFFMltDlsssDtDRDFFMltDlsss
MRDMSFMltDFMRD (RETURN)
```

the computer will respond with Mistake but this does not matter,

```
REPEAT: char$ = GET$:posit = INSTR("drmfslt
DRMFSLTa",char$):pit% = VAL(MID$
("0330410490530610690770810890971011091l
7125129",(posit-1)*3 + 1,3)):SOUND1,-15,
pit%,2:UNTIL FALSE (RETURN)
```

Now move the copy cursor up to the line of characters which you have typed above, think of the rhythm of the carol As With Gladness Men Of Old, and start tapping the copy key.

The process of transferring the notes to a musical score takes up a good part of the program. Each duration note is a character defined in procvdu. The score is displayed in Mode 4 with a yellow score background and a red foreground. At the beginning of each piece four lines of score with treble and base and key signature are constructed. Then as each note is played it appears on the score.

It is my experience that a program is never finished, merely developed. You start with an idea and develop it more and more until it becomes so huge that you scrap it and start again. It is thus that the listed program is open to enhancement. One thing you might like to try is changing the following lines thus:

```
770 pit% = VAL(MID$("033041045053061065
077081089093101109113125129",(posit-1)
*3 + 1,3))
2340 DATA33,45,61,53,65,81,61,77,89
1950 key = VAL(MID$("1432505234161",
pitch/4 + 4 + 12*(pitch >= 40),1))
1960 flat = VAL(MID$("00-100-100-1-100-100-
10000",pitch/2 + 7 + 24*(pitch >= 40),2))
```

This causes all the melodies to be played as if they were written in a minor key, although the score as shown does not allow for the raised 7th and the minor key is a rather crude versions.

The program was developed on a 32K



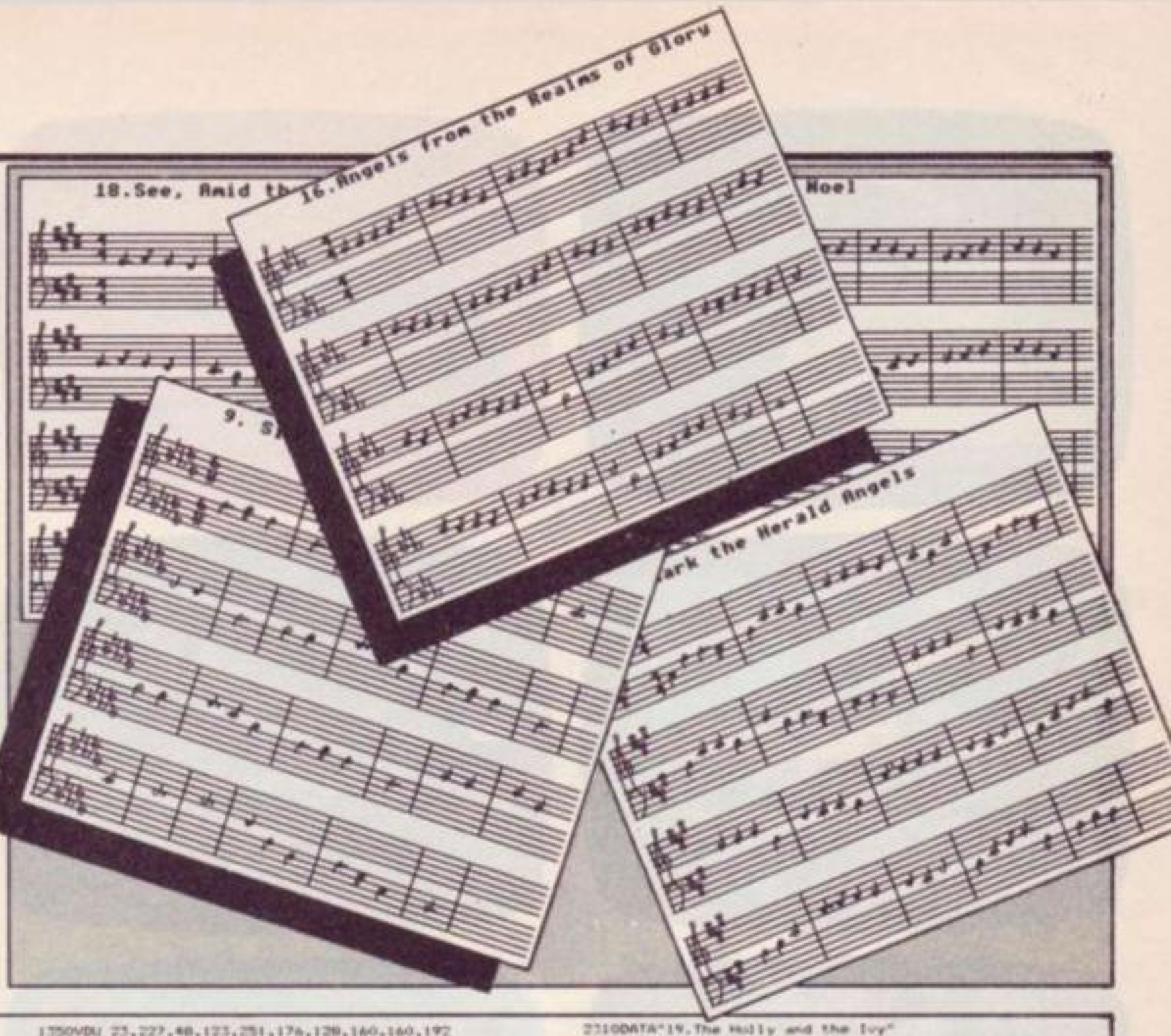
machine — Model B, OS 1.2. It will run on any 32K machine, but will not fit into 16K as memory for the Mode 4 screen. The program Saves in 20 blocks — that is 5K. 16K users could try leaving out all the graphics score routine, meaning variable names, the title list, or the input procedure. I have not included in the listing a profusion of untidy Rem statements. The meaningful variable and procedure names and the colon spacing between each procedure attempt to make the program readable.

To help your understanding of the program and debugging your typing errors the following may be useful:

PROCinput — inputs choice of melody, the key, speed and envelope selection.
PROCread — reads data into the arrays.
PROCfirst — sets up variables at the beginning of each melody.
PROCdata — converts data to pitch and duration numbers.
PROCplay — sounds melody together with harmoney syncronised, and checks for first beat of bar accent.
PROCchoosecord - selects harmony to accompany melody.
PROCenv — defines envelopes.
PROCtoscore - puts note onto screen.
PROCvdu — turns off cursor, defines colours and note characters.
PROCscore - sets up screen.
PROCclef — draws base and treble.
PROCbar — draws barline.
PROCsig — draws key signature.
PROCtotrep — selects random keys, speeds and envelope selections.

```
   10ON ERROR CLEAR
   20DIM chord%(2,2), env%(2,2), pit%(2), title$(19)
   30:
   40:
   50RESTORE
   60PROCread
   70REPEAT
   80MODE7
   90PROCinput
  100MODE4
  110PROCvdu
  120FOR number=0 TO repeat
  130PROCfirst
  140PROCscore
  150FOR char=1 TO LEN(pit$)
  160PROCdata
  170PROCtoscore
  180PROCchosechord
  190PROCplay
  200NEXT
  210pause=GET
  220NEXT
  230UNTIL FALSE
  240END
  250:
  260:
  270DEF PROCread
  280FORC=0TO19
  290READ title$(C)
  300NEXT
  310FORC=0TO2
  320FORK=0TO2
  330READ chord%(C,K)
  340NEXT
  350NEXT
  360FORC=0TO2
  370FORK=0TO2
  380READ env%(C,K)
  390NEXT
  400NEXT
  410ENDPROC
  420:
  430DEF PROCinput
  440totrep=0
  450PRINTTAB(4,2)"CHOICE  (1 to 20)? :"
  460FORC=0TO19
  470PRINTTAB(2,4+C);CHR$(129+(C MOD 7)); title$(C);
  480NEXT
  490REPEAT:PRINTTAB(25,2);SPC(15);:INPUTTAB(25,2) cho
ice: UNTIL choice>0 AND choice<=20 AND choice=INT(choi
ce)
  500IF choice=20 totrep=-1: choice=0: repeat=10: ENDP
ROC
  510CLS
```





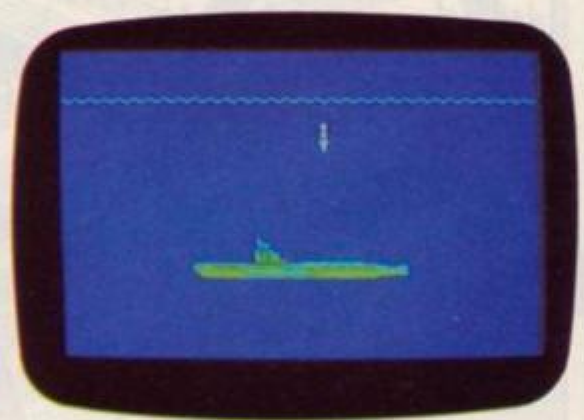

```
520PRINTTAB(2,3)"WHAT IS THE SPEED (1 - 10)?"
530PRINTTAB(2,8)"NO. OF REPEATS?"
540PRINTTAB(2,13)"PITCH (0 - 12)?"
550PRINTTAB(2,18)"ENVELOPE (0 TO 3)?"
560REPEAT:PRINTTAB(4,4);SPC(15);:INPUTTAB(4,4) speed
:UNTIL speed>0 AND speed<11 AND speed=INT(speed)
570REPEAT:PRINTTAB(4,9);SPC(15);:INPUTTAB(4,9) repea
t:UNTIL repeat>=0 AND repeat=INT(repeat)
580REPEAT:PRINTTAB(4,14);SPC(15);:INPUTTAB(4,14) pit
ch:UNTIL pitch>=0 AND pitch<=12 AND pitch=INT(pitch)
590REPEAT:PRINTTAB(4,19);SPC(15);:INPUTTAB(4,19) env
el:UNTIL envel>=0 AND envel<=3 AND envel=INT(envel)
600pitch=pitch*4: speed=(speed+4)/10
610ENDPROC
620:
630DEF PROCfirst
640IF totrep PROCtotrep: choice=choice+1
650RESTORE(2380+30*(choice-1))
660across=1: down=4: sub=0: PROCenv
670transA0=0: transA1=0: transA2=0: transA3=0
680transB0=0: transB1=0: transB2=0: transB3=0
690READ bar,count,top,bottom,scansion,pit$,dur$
700pit$=pit$+"   "
710dur$=dur$+"   "
720ENDPROC
730:
740DEF PROCdata
750char$=MID$(pit$,char,1)
760posit=INSTR("drmfsltDRMFSLTa",char$)
770pit%(0)=VAL(MID$("0330410490530610690770810890971
01109117125129",(posit-1)*3+1,3))
780pitpos=160-posit*8
790char$=MID$(dur$,char,1)
800posit=INSTR(" qDcCeMs",char$)
810dur=VAL(MID$("0004060812162432",(posit-1)*2+1,2))
820notdur=(posit-1)*2-1
830ENDPROC
840:
850DEF PROCplay
860IF count=0 sub=-1: PROCenv
870FOR C=0TO2
880SOUND(&201+C),env%(envel,C),pit%(C)+pitch,dur/spe
ed
890NEXT
900SOUND1,0,0,0
910IF count=0 sub=0: PROCenv
920ENDPROC
930:
940DEF PROCchosechord
950FORC=0TO2
960FORK=0TO2
970IF pit%(0)=chord%(C,K) OR pit%(0)=chord%(C,K)+48
OR pit%(0)=chord%(C,K)+96 THEN pit%(1)=chord%(C,(K+1)M
OD3):pit%(2)=chord%(C,(K+2)MOD3):C=2:K=2
980NEXT
990NEXT
1000ENDPROC
1010:
1020DEFPROCenv
1030ENVELOPE1,1,0,0,0,0,0,0,126,-4,-1,-1,110-sub*16,9
0-sub*10
1040ENVELOPE2,1,0,0,0,0,0,0,126,-4,-1,-1,70-sub*10,50
-sub*10
1050ENVELOPE3,1,0,0,0,0,0,0,60,10,0,-100,50-sub*10,11
0-sub*10
1060ENVELOPE4,1,0,0,0,0,0,0,60,10,0,-100,24-sub*8,50-
sub*10
1070ENDPROC
1080:
1090DEF PROCtoscore
1100transA0=transA1: transA1=transA2: transA2=transA3
: transA3=pitpos
1110transB0=transB1: transB1=transB2: transB2=transB3
: transB3=notdur
1120addur=VAL(MID$("00040608121624432",transB0*2,2))
1130IF addur=0 ENDPROC
1140count=(count+addur) MOD bar
1150pipos=transA0
1160pipos=pipos-VAL(MID$("000808161624322240404848056"
,pitch/2+1,2))
1170nodur=transB0
1180whether=(pipos>72 AND pipos<118) OR pipos<24
1190IF pipos=72 MOVE 156+scansion*across,224*down-72:
PRINTCHR$(240)
1200pipos=pipos-16*whether
1210MOVE 164+scansion*across,224*dow-pipos
1220PRINT CHR$(223+nodur-whether)
1230across=across+1
1240IF count=0 PROCbar
1250IF across>1050/scansion down=down-1: across=0
1260ENDPROC
1270:
1280DEF PROCvdu
1290VDU 23;8202;0;0;0;
1300VDU 19,1,1,0,0,0
1310VDU 19,0,3,0,0,0
1320VDU 23,224,12,10,10,8,104,248,240,96
1330VDU 23,225,48,120,248,176,128,160,160,192
1340VDU 23,226,12,10,10,8,104,251,243,96
1350VDU 23,227,48,123,251,176,128,160,160,192
1360VDU 23,228,8,8,8,8,104,248,240,96
1370VDU 23,229,48,120,248,176,128,128,128,128
1380VDU 23,230,8,8,8,8,104,251,243,96
1390VDU 23,231,48,123,251,176,128,128,128,128
1400VDU 23,232,8,8,8,8,104,152,144,96
1410VDU 23,233,48,72,200,176,128,128,128,128
1420VDU 23,234,8,8,8,8,104,155,147,96
1430VDU 23,235,48,75,203,176,128,128,128,128
1440VDU 23,236,0,0,0,0,112,136,136,112
1450VDU 23,237,112,136,136,112,0,0,0,0
1460VDU 23,238,10,31,10,10,10,10,31,10
1470VDU 23,239,16,16,16,22,25,17,18,12
1480VDU 23,240,0,0,0,0,0,0,255,0
1490VDU 23,241,4,10,10,10,12,12,8,24
1500VDU 23,242,24,40,40,40,72,72,72,72
1510VDU 23,243,136,142,153,153,153,137,137,74
1520VDU 23,244,60,8,8,8,8,8,8,8
1530VDU 23,245,252,130,130,1,1,1,1,1
1540VDU 23,246,1,2,2,4,4,8,48,192
1550ENDPROC
1560:
1570DEF PROCscore
1580CLG
1590VDU4
1600PRINTTAB(5,1); title$(choice-1);
1610VDU5
1620FOR score=896 TO 224 STEP -224
1630FOR line=16 TO 176 STEP 16
1640IF line=96 NEXT
1650MOVE0, score-line
1660DRAW1279, score-line
1670NEXT
1680PROCclef
1690PROCsig
1700NEXT
1710FOR score=880 TO -16 STEP -224
1720MOVE 4,score: DRAW 4,score-160
1730NEXT
1740FOR score=0 TO 96 STEP 96
1750MOVE 164,880-score :PRINTSTR$(top)
1760MOVE 164,848-score :PRINTSTR$(bottom)
1770NEXT
1780ENDPROC
1790:
1800DEF PROCclef
1810MOVE 12,score+16: VDU241,8,10,242,8,10,243,8,10,2
44
1820MOVE 12,score-116: VDU245,8,10,246
1830PLOT 69,48,score-118
1840PLOT 69,48,score-134
1850ENDPROC
1860:
1870DEF PROCbar
1880IF across=0 ENDPROC
1890MOVE 176+scansion*across,224*down-16
1900DRAW 176+scansion*across,224*down-176
1910across=across+1
1920ENDPROC
1930:
1940DEF PROCsig
1950key=VAL(MID$("1432505234161",pitch/4+1,1))
1960flat=VAL(MID$("00-100-100-1-100-100-10000",pitch/
2+1,2))
1970IF key=0 ENDPROC
1980FOR keys=1 TO key
1990po=VAL(MID$("00282404-03616124044082016",4*(keys-
1)-2*flat+1,2))
2000MOVE 48+16*(keys-1),score-po
2010PRINTCHR$(238-flat)
2020MOVE 48+16*(keys-1),score-po-112
2030PRINTCHR$(238-flat)
2040NEXT
2050ENDPROC
2060:
2070DEF PROCtotrep
2080pitch=(RND(13)-1)*4
2090envel=RND(4)-1
2100speed=(RND(4)-1)/10+0.8
2110ENDPROC
2120:
2130DATA"1. Good King Wenceslas"
2140DATA"2. As with gladness men of old"
2150DATA"3. Hark the Herald Angels"
2160DATA"4. O Little town of Bethlehem"
2170DATA"5. In the bleak Mid-winter"
2180DATA"6. O Come all ye faithful"
2190DATA"7. It came upon a mid-night clear"
2200DATA"8. While shepherds watch"
2210DATA"9. Silent Night"
2220DATA"10.Away in a manger"
2230DATA"11.We wish you a Merry Christmas"
2240DATA"12.I saw Three Ships"
2250DATA"13.The First Noel"
2260DATA"14.We Three Kings"
2270DATA"15.God Rest Ye Merry, Gentlemen"
2280DATA"16.Angels from the Realms of Glory"
2290DATA"17.Once In Royal David's City"
2300DATA"18.See, Amid the Winter's Snow"
2310DATA"19.The Holly and the Ivy"
2320DATA"20.Run through total repertoire"
2330:
2340DATA33,49,61,53,69,81,61,77,89
2350:
2360DATA1,4,4,3,1,1,1,2,2,3,4,4
2370:
2380DATA32,0,4,4,60
2390DATA"DDDRDDslsltDDDDRDDslsltDDSFMRMRDlsltDDssltD
DRSFMRDFD"
2400DATA"cccccmccccmmcccccccmcccccmmccccccmccccmmccccc
cmcccccmms"
2410DATA32,0,4,4,76
2420DATA"DtDRDFFMltDlsssDtDRDFFMltDlsssMRDMSFMltDFMRD"
2430DATA"cqqccccmccccccmcqqccccmccccccmccccCqmcccccccm
"
2440DATA32,0,4,4,44
2450DATA"sDDtDMMRSSSFMRMsDDtDMMRSRRttlsSSSDFMMRSSSDFM
MRLLLSFMFMMFSDDRMLLLSFMFMMFSDDRD"
2460DATA"ccCqcccccccCqccmccCqccccccCqccmcccccccccccccccc
ccccccccmcqqCqccmCqccccmcqqCqccm"
2470DATA32,24,4,4,48
2480DATA"sDDDRMRMFSMFMDRRDsDDDRMRMFSMFMDRRDDMSLSFMRDR
MFSaDMRDssDDDRMRMFSMFMDRRD"
2490DATA"cccccqqqqccccqqccMcccccqqqqccccqqccMqqCqqqqqqq
qqcccccccmmccccqqqqccccqqccM"
2500DATA32,0,4,4,72
2510DATA"MFSMRDRMRlRMFSMRDRMRDDFMFSLLMSMRDtMFSMRDRMRD
D"
2520DATA"CqccmmCqccsCqccmmccCqsCqccccmccccsCqccmmccCq
s"
2530DATA32,24,4,4,52
2540DATA"DDsDRsMRMFMRDDtltDRMltssSFMFMRMDRtsDDtDRDsMM
RMFMRMFMRDtDFMRDD"
2550DATA"cmccmmcccccmccmcccccmCqsmccmmccccmccccccmccc
cccmcccccccmcccmCqs"
2560DATA32,24,4,4,52
2570DATA"DRMRDRMFMRSSMFSLSMFSSMDFMRDRMFSMRDDtltRDtlMR
DtlssSFMRMFMRDRMFSMRD"
2580DATA"qqccccqqccccccqqcMqqcccccccqqqqcccMcccccCqccc
cccMcccccqqcccqqqqcccM"
2590DATA32,24,4,4,58
2600DATA"DMMRDFFMRMSSMSMLSFMFDtMRDDtDDMMRDFFMRMSSMSML
SFMRDtMRDDtD"
2610DATA"cCqccccccccccccMcCqcccccccccccMcCqcccccccccccMcC
qccccccccccM"
2620DATA24,0,6,8,60
2630DATA"slsmslsmRRtDDsllDtlslsmllDtlslsmRRFRtDMDsmsF
rd"
2640DATA"CqcMCqcMmcMmcMmcCqcCqcMmcCqcCqcMmccccMMcqcCq
cM"
2650DATA24,16,3,4,61
2660DATA"sDDRMDDMFSSLFRMFFSMMDMRlDtsDDRMDDMFSSLFRMFFS
MMDMRltD"
2670DATA"cccqqccqqcccmqqcccccqqcccmcccqqccqqcccmqqccc
ccqqcccm"
2680DATA24,16,6,8,60
2690DATA"sDDRDtlllRRMRDtsssMMFMRDlsslRtDsDDDtlDtlsMMR
RDDSsssRtD"
2700DATA"ccqqqqcccqqqqccqqcqqqqccqqcccmcccmccccmccq
qqqccqqcccm"
2710DATA24,20,6,8,104
2720DATA"sDDRMSMRFMDDMRtssDDRMSMRFMDDRMRD"
2730DATA"qcqcqcqcqcqcqcqcqcqcqcqcqcqcqqqqCC"
2740DATA24,16,3,4,44
2750DATA"MRDRMFSLTaTLSLTaTLSLTaSFMMRDRMFSLTaTLSLTaTLS
LTaSFMMRDRMFSaTLLSaTLSLTaSFM"
2760DATA"qqCqqqmqqcccmqqcccccccccmqqCqqqmqqcccmqqcccc
cccccmqqCqqqmqqqmcMcccccccccM"
2770DATA24,0,3,4,54
2780DATA"MRDltDtlMRDltDtlDDRRMMSFMRMRDtltRDDDsDlDDDDs
DlDDDRMFMRMDDDsDlD"
2790DATA"cqcqqqqCcqcqqqqCcqcqcqqqqqqqcqCcqcqcqcqCcqcq
cqCcqcqcqcqcqcqC"
2800DATA32,24,4,4,48
2810DATA"llMMRDtlsltDRMllMMRDtlsltDRMMFMFSLMRDltDRDR
MFMMRDtlDtlRDRMFSLMRDtl"
2820DATA"cccccccccccccMccccccccccccMccccccccccccccmcc
mccccccmqqcmcccccccccccM"
2830DATA32,0,4,4,40
2840DATA"MMMMSSFMDMMRMMSSFMMMMSSFMDMMRMMSSFMSLSFMFSF
MRMFMRDRsDRMFMRSLSFMFSFMRMFMRDRsDRMFMRD"
2850DATA"cccqqCqcccqqcqqCqmcccqqCqcccqqcqqCqmmqqqqmqq
qqmqqqqmcccmmmqqqmqqqqmqqqqmcccmms"
2860DATA32,0,4,4,64
2870DATA"stDDDtDRRDDMMMRDtDstDDDtDRRDDMSMMRDtDLLSDFF
MLLSMMRDtD"
2880DATA"ccCqqqqqcccccCqqqqqmccCqqqqqcccCqqqqqmccCqcc
mccCqqqqqm"
2890DATA32,0,4,4,56
2900DATA"DRDtlssDRFMMRDRDtlssDRMFRDDDSSFMRDLSSFMRDtDR
DtlssSMDFMRD"
2910DATA"CqccCqmccccCqmCqccCqmcccCqmCqccccmCqccccmCq
ccCqmCqccccm"
2920DATA32,0,4,4,56
2930DATA"DDDDLSMDDDDLSSFMRDMMllsDRMFMRDDDDLSMDDDDLSS
FMRDMMllsDRMFMRD"
2940DATA"cqqcccCqqqccmqqqqcqqqqcqqqqcmcqqcccCqqqccmq
qqqcqqqqcqqqqccm"
```



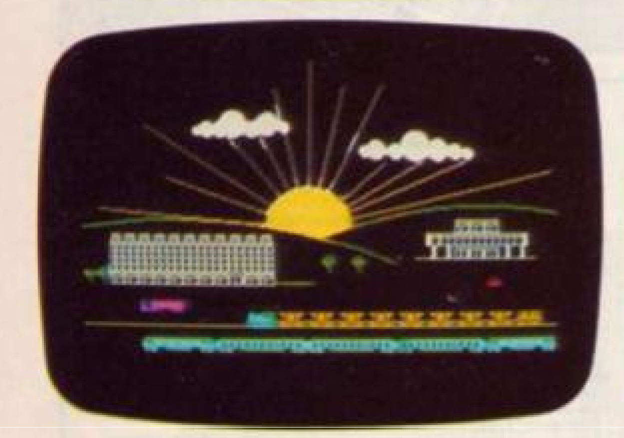








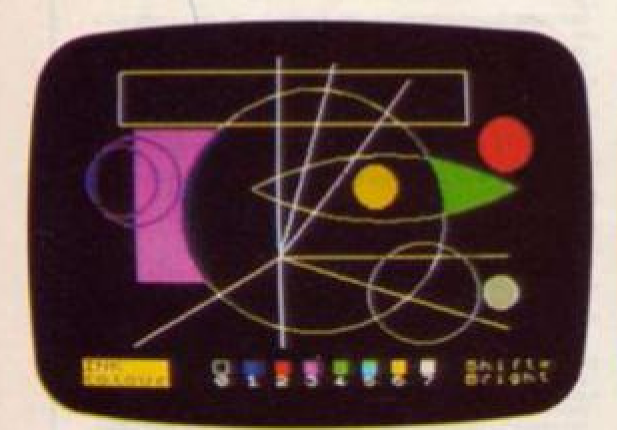








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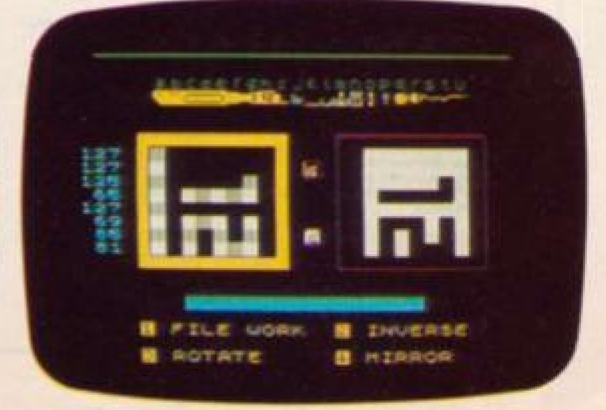












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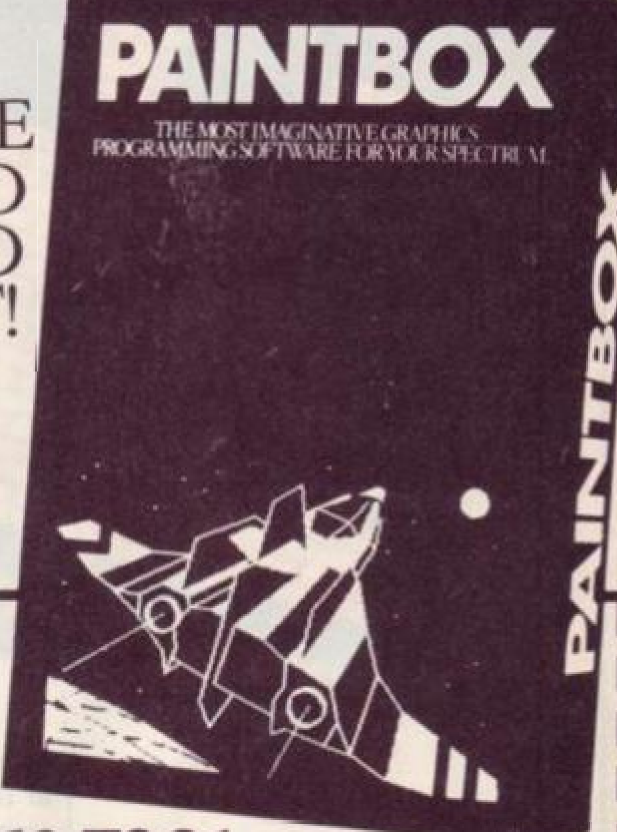
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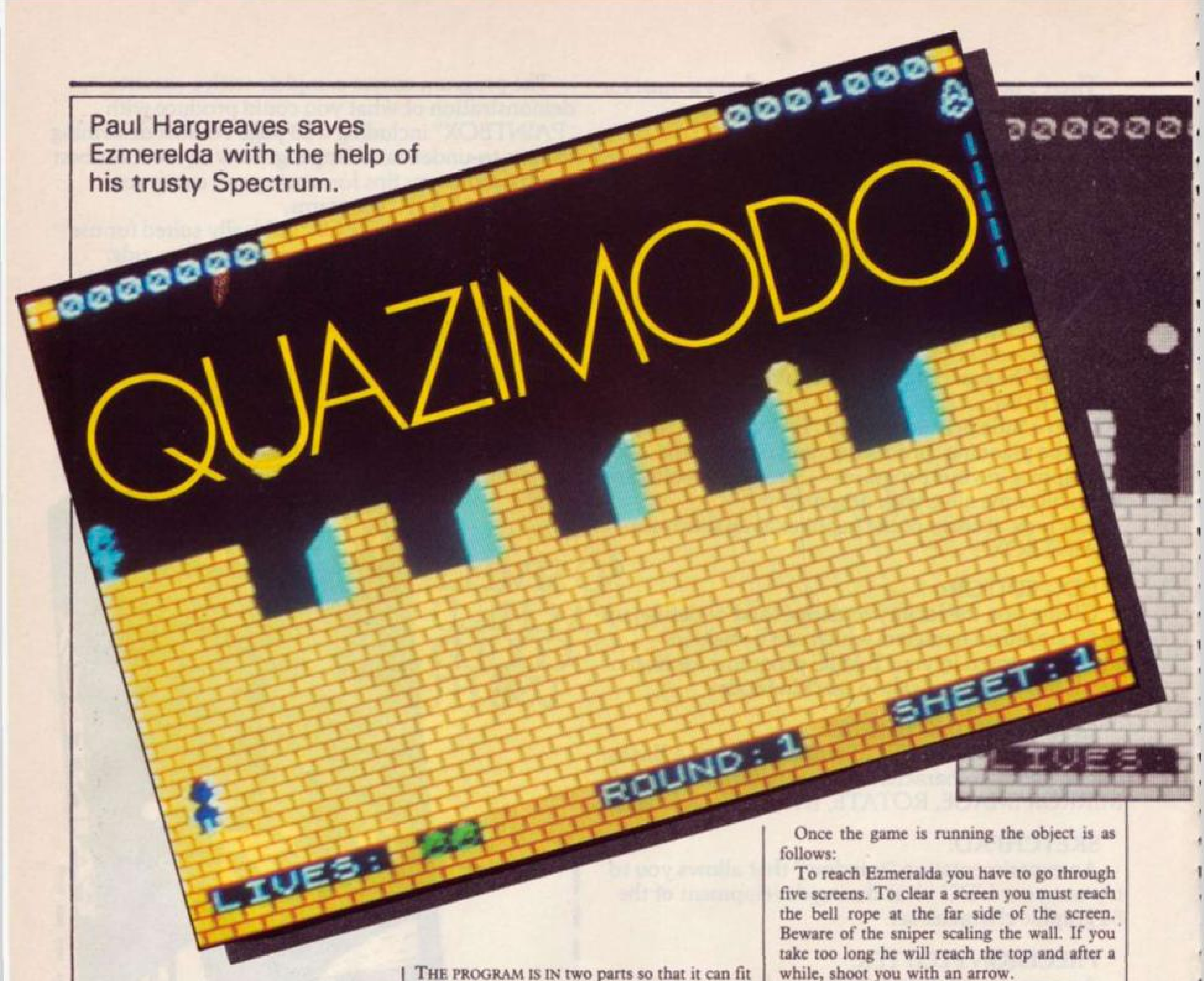
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Paul Hargreaves saves Ezmerelda with the help of his trusty Spectrum.



THE PROGRAM IS IN two parts so that it can fit in 16K. The first one is for graphics and the second is the game. The graphics program should be Saved first before typing in the game.

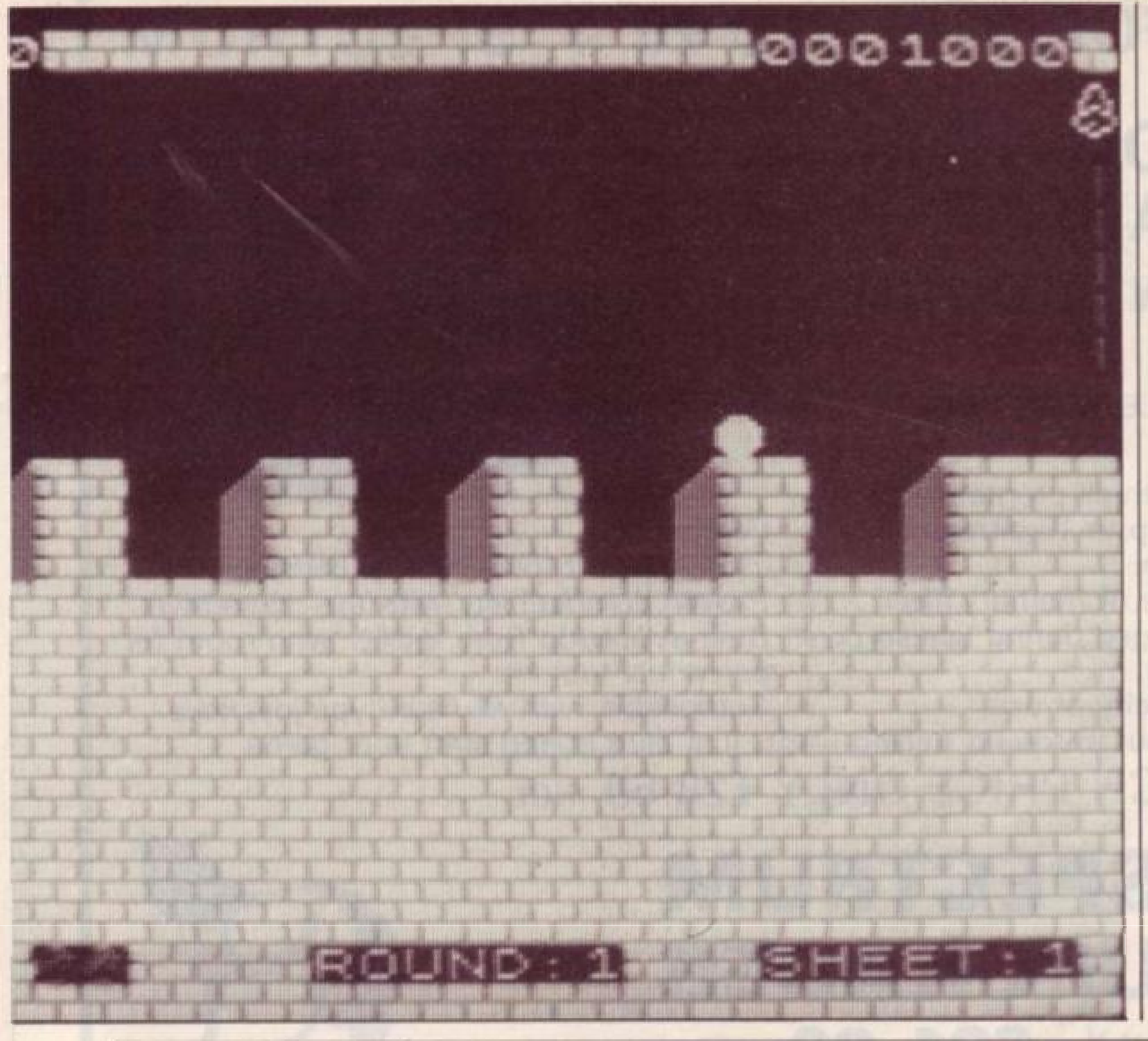
Once the game is running the object is as follows:

To reach Ezmeralda you have to go through five screens. To clear a screen you must reach the bell rope at the far side of the screen. Beware of the sniper scaling the wall. If you take too long he will reach the top and after a while, shoot you with an arrow.

By the way, he gets faster each round, up until the fourth one. If you manage to save Ezmeralda without losing a life then a super bonus is awarded.

Listing 1.

```
  10 BORDER 0: PAPER 0: INK 7: C
LS : PRINT AT 11,10; FLASH 1; PA
PER 1;"STOP THE TAPE"
  20 FOR a=144 TO 164: BEEP .01,
a-144: FOR b=0 TO 7: READ c: POK
E USR CHR$ a+b,c: NEXT b: NEXT a
  30 DATA 56,124,126,244,236,194
,68,120,250,255,126,56,56,48,48,
56
  40 DATA 28,62,126,47,55,67,34,
30,95,255,126,28,12,12,12,28
  50 DATA 124,252,186,191,56,124
,68,198
  60 DATA 62,63,61,253,28,125,66
,195
  70 DATA 254,254,254,0,239,239,
239,0
  80 DATA 0,0,4,194,255,194,4,0,
0,0,32,67,255,67,32,0
  90 DATA 0,0,24,36,36,66,90,102
,129,145,102,24,0,0,0,0
 100 DATA 1,3,7,15,31,63,127,255
 110 DATA 250,255,126,56,56,29,1
5,7
 120 DATA 28,62,62,127,127,127,6
2,28
 130 DATA 62,127,127,127,54,54,1
18,7
 140 DATA 62,127,127,127,54,54,5
5,112
 150 DATA 60,126,255,255,255,255
,126,60
 160 DATA 24,24,60,90,24,24,60,2
4
 170 DATA 0,60,46,70,70,39,55,55
 180 DATA 250,60,60,126,126,126,
255,36
 190 DATA 8,41,84,118,165,173,80
,255
 200 BORDER 0: PAPER 0: INK 7: C
LS
 210 PRINT AT 1,2; INK 6;"THE HU
NCHBACK OF NOTRE DAME"
 220 PRINT '''TAB (5); PAPER 1;"
BY P.HARGREAVES 16/9/83"
 285 PRINT AT 10,8; INK 6; PAPER
 2;"LOADING PART TWO";AT 19,2;"P
RESS PLAY ON TAPE RECORDER"
 295 INK 0: PRINT AT 17,3;: LOAD
""
 300 STOP
```



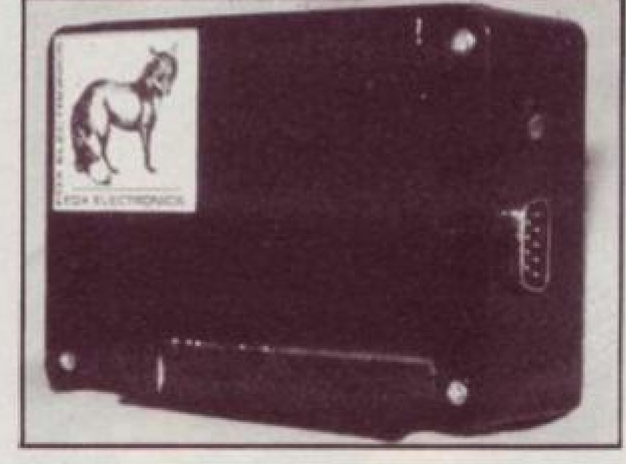
Listing 2.

Note: the letters between quotat ion marks in PRINT statements an d LET statements shouldbe entere d in graphics mode

```
   1 LET hi=1000
  10 GO SUB 9000
  20 GO SUB 8900
  30 GO SUB 8000
 100 PRINT AT x,y;" ";AT x+1,y;"
"
 105 IF INKEY$="" THEN GO TO 100
 110 IF INKEY$="3" THEN LET m$="
A": LET n$="B": IF y<31 AND ATTR
 (x+1,y+1)<>86 THEN LET y=y+1
 115 IF INKEY$="1" THEN LET m$="
C": LET n$="D": IF y>0 AND ATTR
 (x+1,y-1)<>86 THEN LET y=y-1
 120 IF INKEY$="0" THEN GO TO 20
0
 130 IF y=31 THEN GO TO 1000
 150 PRINT AT x,y; INK 5;m$;AT x
+1,y;n$
 155 GO SUB 300
 160 GO SUB 400+(l*100)
 165 IF ATTR (x+2,y)<>86 THEN GO
 TO 240
 170 IF ATTR (x,y)<>69 OR ATTR (
x+1,y)<>69 THEN GO TO 2000
 190 GO TO 100
 200 IF m$="C" THEN LET n$="F":
LET jd=-1: GO TO 215
 205 IF m$="A" THEN LET n$="E":
LET jd=1: GO TO 215
 210 LET jd=0
 215 FOR a=-1 TO 1 STEP .5: PRIN
T AT x,y;" ";AT x+1,y;" ": LET x
=x+a: IF y<31 AND y>0 THEN LET y
=y+jd
 219 PRINT AT x,y; INK 5;m$;AT x
+1,y;n$: GO SUB 400+(l*100)
 220 IF rh=0 AND y=INT (rp/8) OR
 y+1=INT (rp/8) THEN GO TO 270
 221 IF y=31 THEN GO TO 1000
 225 IF l=2 OR l=4 THEN GO TO
235
 230 IF ATTR (x,y)<>69 OR ATTR (
x+1,y)<>69 THEN GO TO 2000
 235 BEEP .01,a: NEXT a: IF ATTR
 (x+2,y)=86 THEN GO TO 150
 240 GO TO 2000
 270 LET rh=1: PRINT AT x,y;" ";
AT x+1,y;" ": LET y=INT (rp/8):
LET x=8: LET m$="A": LET n$="B"
 275 PRINT AT x,y;" ";AT x+1,y;"
": LET y=(rp/8)-1
 280 PRINT AT x,y; INK 5;"A";AT
x+1,y;"M"
 285 BEEP .005,y: GO SUB 300: GO
 SUB 600
 290 IF INKEY$="0" THEN GO TO 20
0
 295 GO TO 275
 300 IF bx=9 THEN GO TO 320
 305 LET bx=bx-(rp/8): PRINT AT
bx,1; PAPER 6; INK 1;"N";AT bx+1
,1;"P";AT bx+2,1; INK 6; PAPER 2
;"G"
 310 IF bx=9 THEN PRINT INK 6;
PAPER 2;AT 10,1;"G";AT 11,1;"G"
 315 RETURN
 320 PRINT AT 8,1; INK 5;"N";AT
9,1;"O": LET m=bx-1: IF bx<0 TH
EN FOR a=2 TO y-1: PRINT AT x+1,
a; INK 5;"H": BEEP .01,a: BEEP .
005,0: BEEP .001,-5: PRINT AT x+
1,a;" ": NEXT a: GO TO 2000
 350 RETURN
 500 PRINT AT 9,ax;" ";AT 7,29-a
x;" ": LET ax=ax-1: IF ax<1 THEN
 LET ax=29
 505 PRINT AT 9,ax; INK 6;"O";AT
 7,29-ax;"O"
 590 RETURN
 600 PLOT 128,167: DRAW INVERSE
1;rp-128,-60
 605 LET rp=rp+rd
 610 IF rp>150 THEN LET rd=-5
 615 IF rp<100 THEN LET rd=5
 690 PLOT 128,167: DRAW rp-128,-
60: RETURN
 700 FOR B=6 TO 26 STEP 5: PRINT
 AT AX,B; INK 4;"R";AT AX-1,B; I
NK 7;" ": NEXT B
 705 LET AX=AX+AD: IF AX=8 THEN
LET AD=1
 710 IF AX=10 THEN LET AD=-1
 795 RETURN
 800 GO SUB 600: PRINT AT 10,ax;
 INK 6; PAPER 2;"G";AT 10,31-ax;
"G": PRINT AT 10,ax+1;" ";AT 10,
30-ax;" ": LET ax=ax+ad/2: IF ax
=4 OR ax=14 THEN LET ad=-ad
 805 RETURN
 900 PRINT AT 1,ax; INK 5;"N";
AT 2,ax;"O": LET ax=ax+(ax<27
AND ax<y)-(ax>2 AND ax>y)
 905 PRINT AT by,bx;" ": LET by=
by+1: IF by=9 THEN LET by=4: LET
 bx=ax
 910 PRINT AT by,bx; INK 6;"O"
 915 PRINT AT 9,cy; INK 6;"I";A
T 7,29-cy;"H": LET cy=cy-1: IF
cy=0 THEN PRINT AT 7,29;" ";AT 9
,1;" ": LET cy=29
 935 RETURN
 940 PRINT AT 5,31; INK 5;"I";AT
 6,31;"I";AT 1,ax+1;" ";AT 2,ax+
1;" ": FOR a=29 TO 2 STEP -1: PR
INT INK 7;AT 1,a;"C";AT 2,a;"D"
: BEEP .01,a: PAUSE 5: PRINT AT
2,a;"F": BEEP .01,-a: PAUSE 5:
NEXT a
 955 LET sc=sc+(ro*1000)
 970 PRINT AT 10,2;"WELL DONE
YOU HAVE SAVED";AT 12,11;"EZMER
ALDA": FLASH 1: INK 0: PAPER 4;A
T 15,5;"NOW TRY AGAIN QUASIMODO"
 975 FOR a=1 TO 255: OUT 254,-a:
 NEXT a
 980 LET ro=ro+1: IF be=4 THEN L
ET sc=sc+(ro*250): PRINT AT 17,4
;"SUPER BONUS ";ro*250
 985 FOR a=1 TO 60 STEP 2: BEEP
.01,a: NEXT a
 986 IF RO>4 THEN LET RO=4
 990 LET l=1: LET be=0: GO TO 2
0
1000 PRINT AT x,y;" ";AT x+1,y;
" ": FOR a=7 TO 6 STEP -1: PRINT
 AT a,31; INK 5;"A";AT a+1,31; IN
K 5;"M": BEEP .2,30: BEEP .2,25:
 PRINT AT a+1,31;" ": NEXT a
1005 IF l=5 THEN GO TO 940
1010 LET sc=sc+100: LET l=l+1:
 LET be=be+1: GO TO 30
2000 LET be=0: FOR a=255 TO 0 ST
EP -5: PRINT AT x,y; INK INT (RN
D*7); PAPER INT (RND*7);m$;AT x+
1,y;n$: OUT 254,a: NEXT a
2010 LET li=li-1: IF li=0 THEN G
O TO 2020
2015 GO TO 30
2020 PRINT AT 11,12; PAPER 2;"GA
ME OVER": FOR a=50 TO -50 STEP -
5: BEEP .01,a: BEEP .01,0: BEEP
.005,-5: NEXT a: PRINT AT 13,2;
FLASH 1;"PRESS ANY KEY TO PLAY A
GAIN"
2025 IF sc>hi THEN LET hi=sc
2030 IF INKEY$="" THEN GO TO 203
0
2035 GO TO 10
8000 BORDER 0: PAPER 0: INK 7: B
RIGHT 1: CLS : PRINT AT 0,0; INK
 6; PAPER 2;a$: PRINT AT 0,1;"00
00000";AT 0,24;"0000000"
8005 PRINT AT 0,8-LEN STR$ sc;sc
;AT 0,31-LEN STR$ hi;hi
8010 PRINT #0;AT 0,0; INK 6; PAP
ER 2;a$;AT 1,0;a$: FOR a=1 TO li
: PRINT #0;AT 0,a+7; INK 4;"Q":
NEXT a
8015 PRINT #0;AT 0,1;"LIVES";AT
0,14;"ROUND ";ro;AT 0,24;"SHEET
";l
8020 FOR a=1 TO 14: PRINT AT 0,a
*2+9; INK 5;"J";AT 1,a*2+9;"K":
NEXT a
8030 FOR a=10 TO 21: PRINT AT a,
0; INK 6; PAPER 2;a$: NEXT a
8040 PRINT AT 1,31;"J";AT 2,31;"
K": FOR a=3 TO 7: PRINT AT a,31;
 INK 5;"I": NEXT a
8045 LET rp=300: LET rd=0
8050 GO SUB 8050+(l*50)
8055 IF LE=1 THEN LET A=31: GO T
O 8500
8060 LET rh=0: LET bx=19
8065 LET x=8: LET y=0: LET m$="A
": LET n$="B"
8090 RETURN
8100 FOR a=10 TO 12: FOR b=5 TO
25 STEP 5: PRINT AT a,b;" "; IN
K 5;"█": NEXT b: NEXT a
8105 FOR b=7 TO 27 STEP 5: PRINT
 AT 10,b; INK 5;"L": NEXT b
8110 LET ax=20: LET ay=6
8120 RETURN
8150 FOR a=10 TO 19: PRINT AT a,
10;"          "; INK 5;"█": NEX
T a: PRINT AT 20,10; INK 5; PAPE
R 2; FLASH 1;"UUUUUUUUUUU"
8155 LET rp=120: LET rd=5
8160 PRINT AT 10,21; INK 5;"L"
8165 RETURN
8200 GO SUB 8100: FOR a=6 TO 26
STEP 5: PRINT AT 11,a;"N";AT 12,
a;"O": NEXT a
8205 LET ax=10: LET ad=-1
8210 RETURN
8250 FOR a=10 TO 19: PRINT AT a,
5;"                    "; INK 5
;"█": NEXT a: PRINT AT 20,5; INK
 5; PAPER 2; FLASH 1;"UUUUUUUUU
UUUUUUUUUUU": PRINT INK 5;AT 10
,26;"L"
8255 LET ax=5: LET ad=1
8260 LET rd=5: LET rp=120
8295 RETURN
8300 GO SUB 8100: PRINT AT 3,2;
INK 6; PAPER 2;a$( TO 28): PRINT
 AT 2,1;"S";AT 3,1;"T"
8305 PRINT AT 4,0; INK 6; PAPER
2;"GGG";AT 4,29;"GG"
8310 LET cy=29: LET ax=16: LET b
y=4: LET bx=ax
8345 RETURN
8500 RESTORE 8515
8505 FOR B=-1 TO 1: PRINT AT 19+
B,A; INK 5;"C";AT 20+B,A;"D": PA
USE 2: PRINT AT 20+B,A; INK 5;"F
": BEEP .05,B: PRINT AT 19+B,A;
INK 6; PAPER 2;"G";AT 20+B,A;"G"
: LET A=A-1: IF A=0 THEN FOR B=2
1 TO 10 STEP -1: PRINT AT B,A; I
NK 6; PAPER 2;"G";AT B-1,A; INK
5;"B";AT B-2,A;"A": BEEP .05,B:
NEXT B: GO TO 8070
8510 NEXT B: GO TO 8505
8900 LET sc=0: LET l=1: LET li=
3: LET a$="GGGGGGGGGGGGGGGGGGGG
GGGGGGGGGGGG": LET be=0
8905 LET ro=1
8910 LET b$="

8990 RETURN
9000 BORDER 0: PAPER 0: INK 7: C
LS : PRINT AT 0,0; INK 5;"G  G
 G  G  G  GG  G  G G  G  G G GGGG
 G GG G  G  G  G  G  G G  GGGG
 G  G GG  G  GGGG  G  G  G  G
 G  G  G  G  G  G  G  G  G  G
GG  G  G  GG  G  G  G"
9010 PRINT ''"WRITTEN BY P.HARGRE
AVES 18/9/83"
9015 PRINT ''" YOUR MISSION IS T
O GUIDE        QUASIMODO OVER THE
 CASTLE        RAMPARTS AND REACH
 EZMERALDA.  ''" TO DO SO YOU W
ILL HAVE TO GET  THROUGH FIVE SC
REENS"
9020 PRINT '" ON THE ROPE SCREEN
YOU JUMP ON THE ROPE AND SWING A
CROSS."''" BEWARE OF THE SNIPER S
CALING  THE CASTLE WALL.HE WILL
 SHOOT  YOU IF YOU TAKE TOO LON
G."
9025 PRINT ''" KEYS ARE 1 I H 3
 JUMP=0": PRINT #0;AT 1,1; INK 4
; FLASH 1; PAPER 0;"PRESS ANY KE
Y TO PLAY HUNCHY"
9030 IF INKEY$="" THEN GO TO 903
0
9040 RETURN
```

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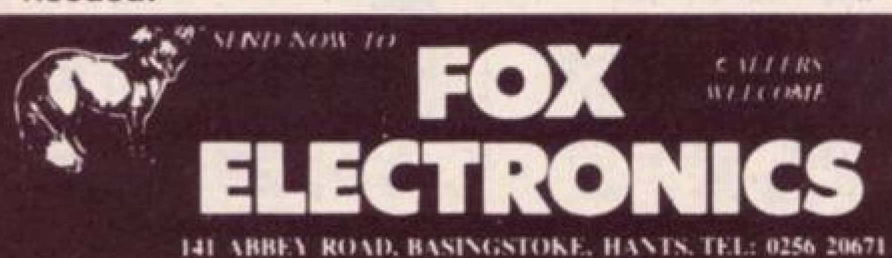
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Begin by typing in

PCLEAR 8

(continued on next page)

Machine code loader.

```
10 REM MACHINE CODE LOADER
20 PRINT "TYPE '999' TO END"
30 INPUT "ENTER START
ADDRESS";S
40 PRINT S;:INPUT V
50 IF V=999 THEN END
60 POKE S,V:S=S+1
70 GOTO 40
```

Basic program.

```
10 REM SKYSHIELD
20 REM  (C) COPYRIGHT 1983
30 REM   BY A.M.RICHARDS
40 REM INSTRUCTIONS "
50 HS=0
60 CLS:PRINT"  MISSILE COMMAND."
70 PRINT" DO YOU REQUIRE INSTRUCTIONS"
80 A$=INKEY$:IFA$=""THEN80
90 IF A$="Y" GOSUB 680
100 REM INITIALISE VARIABLES
110 REM C1-C6 CITIES
120 REM S1-S3 SCORE
130 REM B1-B3 BASES
140 M=3:B1=&H71F7:B2=&H71F8:B3=&H71F9:C1=&H74A9:C2=&H7
4AA:C3=&H74AB:C4=&H74AC:C5=&H74AD:C6=&H74AE:S1=&H71F4:
S2=&H71F5:S3=&H71F6:L=1:QW=6:EB=1:SC=0
150 POKES1,0:POKES2,0:POKES3,0:POKEC1,1:POKEC2,1:POKEC
3,1:POKEC4,1:POKEC5,1:POKEC6,1:R1=50
160 PMODE4,1:PCLS
170 CLS2:PRINT@65,"LEVEL";:PRINT@75,L;
180 PRINT@97,"CITIES";:PRINT@107,QW;
190 PRINT@129,"SCORE";:PRINT@139,SC;
200 REM PRINT UP PLANET
210 EXEC&H1E20
220 REM SET UP MISSILES PATHS               AND SPEEDS.
230 FORI=&H32E1 TO &H32E1+49*9 STEP 9
240 POKEI,4:POKEI+1,RND(255):POKEI+6,RND(15):POKEI+4,R
ND(20)+R1:POKEI+8,1
250 X=RND(2):IFX=2THENX=255
260 POKEI+3,X:NEXT
270 SCREEN1,1
280 POKE&H71F3,0:POKE&H71FE,M-1
290 REM WORK OUT NUMBER OF                 MISSILES IN BA
SE
300 K=INT((M+M/.5)/3+1):POKEB1,K:POKEB2,K:POKEB3,K
310 REM EXECUTE MAIN M/C PROG
320 CLS
330 EXEC&H2000
340 REM EXECUTE M/C END-OF-GAME            SOUND
350 EXEC&H2850
360 FORI=1TO1000:NEXT
370 REM EXECUTE M/C CITY CHECK
380 EXEC&H2904
390 PCLS:CLS2:SCREEN0,0
400 FORI=0TO1000:NEXT
410 REM INCREMENT SCORE
420 SC=PEEK(S1)*10000+PEEK(S2)*1000+PEEK(S3)*100
430 KL=PEEK(B1)+PEEK(B2)+PEEK(B3):IFKL=0THEN450
440 FORI=1TO KL:PRINT@129,"SCORE";:PRINT@139,SC;:SC=SC
+100:PLAY"V31T50CB":NEXT
450 QW=PEEK(C1)+PEEK(C2)+PEEK(C3)+PEEK(C4)+PEEK(C5)+PE
EK(C6)
460 IFQW=0THEN480
470 FORI=1TO QW:PRINT@129,"SCORE";:SC=SC+300:PRINT@139
,SC;:PLAY"V31O1T50DEFCD3":NEXT
480 T1=INT(SC/10000):T2=INT((SC-T1*10000)/1000):T3=INT
((SC-T1*10000-T2*1000)/100)
490 POKES1,T1:POKES2,T2:POKES3,T3
500 REM EXTRA BASE "
510 IF SC>EB*10000 THEN EB=EB+1:FORI=C1 TO C6:IFPEEK(I
)=0 THEN POKEI,1:PLAY"T255CEFAGDBAGDCEFAGDBEFCAECGDEEG
GABCEGDA":QW=QW+1:GOTO520 ELSE NEXT
520 M=M+3:IFM>49THENM=49
530 L=L+1
540 R1=R1-INT(M/3):IFR1<0THENR1=0
550 IFQW=0THEN580
560 GOTO 160
570 REM END OF GAME
580 CLS2:PRINT@33,"UNFORTUNATELY ALL OF YOUR";
590 PRINT@65,"CITIES HAVE BEEN DESTROYED'";
600 PRINT@129,"YOUR SCORE WAS";SC;
610 IFSC>HS THENHS=SC:PRINT@161,"AND YOU ACHIEVED HI-S
CORE";:GOTO630
620 PRINT@161,"HI-SCORE IS";HS;
630 PRINT@257,"DO YOU WANT ANOTHER GAME (Y/N)";
640 A$=INKEY$:IFA$=""THEN640
650 IFA$="Y"THEN140
660 IFA$<>"N"THEN640
670 CLS:END
680 CLS:PRINT"YOU ARE THE DEFENCE OFFICER OF  THE PLAN
ET NOGARD. UNFORTUNATELYYOUR CUSHY, DULL JOB LIVENS UP
 ABIT WHEN A BATCH OF GALATIC     MISSILES ARE AIMED A
T THE PLANET";
690 PRINT"YOU MUST PROTECT SIX CITIES THATREST ON THE
TOP OF THE PLANET   WITH YOUR OWN INTERCEPT MISSILESWH
ICH ARE CONTROLED BY A SIGHT."
700 PRINT"WHEN YOU THINK THE SIGHT IS IN  THE RIGHT PL
ACE TO DESTROY AN   ENEMY MISSILE THEN PRESS THE    FI
RE BUTTON ON THE JOYSICK. A   MAXIMUM OF TEN MISSILES
CAN BE  FIRED IN SUCCESSION BEFORE THE  GUN CREW MUST
REST.";
710 IFINKEY$=""THEN710
720 PRINT
730 PRINT"ENEMY MISSILES ARE ONLY           DESTROYED IF
 THEY ARE IN THE     MIDDLE OF AN EXPLOSION CREATED  BY
 YOUR OWN MISSILES. YOU STAY  ALIVE AS LONG AS AT LEAS
T ONE   OF YOUR CITIES REMAINS INTACT.  EXTRA CITIES A
RE GAINED AT EVERY100000 POINTS."
740 PRINT"YOUR SIGHT IS CONTROL BY THE    LEFT JOYSTIC
K ONLY AND THE RIGHTJOYSTICK must BE REMOVED. THE   SI
GHT CAN MOVE OFF THE END OF   THE SCREEN (LEFT OR RIGH
T) AND  WILL RE-APPEAR ON THE OTHER SIDEBUT THIS DOES
NOT WORK FOR TOP  AND BOTTOM.";
750 IFINKEY$=""THEN750
760 PRINT:PRINT"TO THE LEFT, RIGHT AND CENTRE OFTHE SC
REEN ARE YOUR BASES        CONTAINING THE MISSILES, AND
    UNDER THESE A NUMBER SHOWS HOW  MANY MISSILES YOU
HAVE IN THAT  BASE. YOUR PRESENT SCORE IS     ALSO DIS
PLAYED AT THE TOP-RIGHT OF THE SCREEN
770 PRINT"AFTER YOU HAVE COMPLETED EACH   WAVE YOUR RE
MAINING MISSILES ANDNUMBER OF CITIES ARE ADDED TO   YO
UR SCORE, 300 FOR A CITY AND  100 FOR A MISSILE. THE G
AME      STARTS WITH ONLY THREE MISSILES COMING DOWN FR
OM THE TOP OF THE"
780 PRINT"SCREEN AND GETS A LOT HARDER.";
790 IFINKEY$=""THEN790
800 PRINT:PRINT"YOU START OF WITH 4 MISSILES IN EACH B
ASE SO FIRE CAREFULLY.    BE PREPARED FOR A DRASTIC CH
ANGEIN SPEED AT LEVEL 10 OR YOU WILLFIND YOURSELF DEAD
 IN RATHER A  SHORT TIME."
810 PRINT:PRINT:PRINT"GOOD LUCK "
YOU'LL NEED IT ":PRINT:PRINT:PRINT:PRINT:PRINT
820 IF INKEY$=""THEN820
830 RETURN
```

(continued from previous page)

and then type in the machine-code loader program, and enter the machine code. After entering the machine code Save what you have done by typing

CSAVEM"COM(M)",&H1E00,&H34FF,&H1E00

which will Save both chunks of the machine code — and program and data — together, or, if you require to Save them separately because you are short of tape, then type

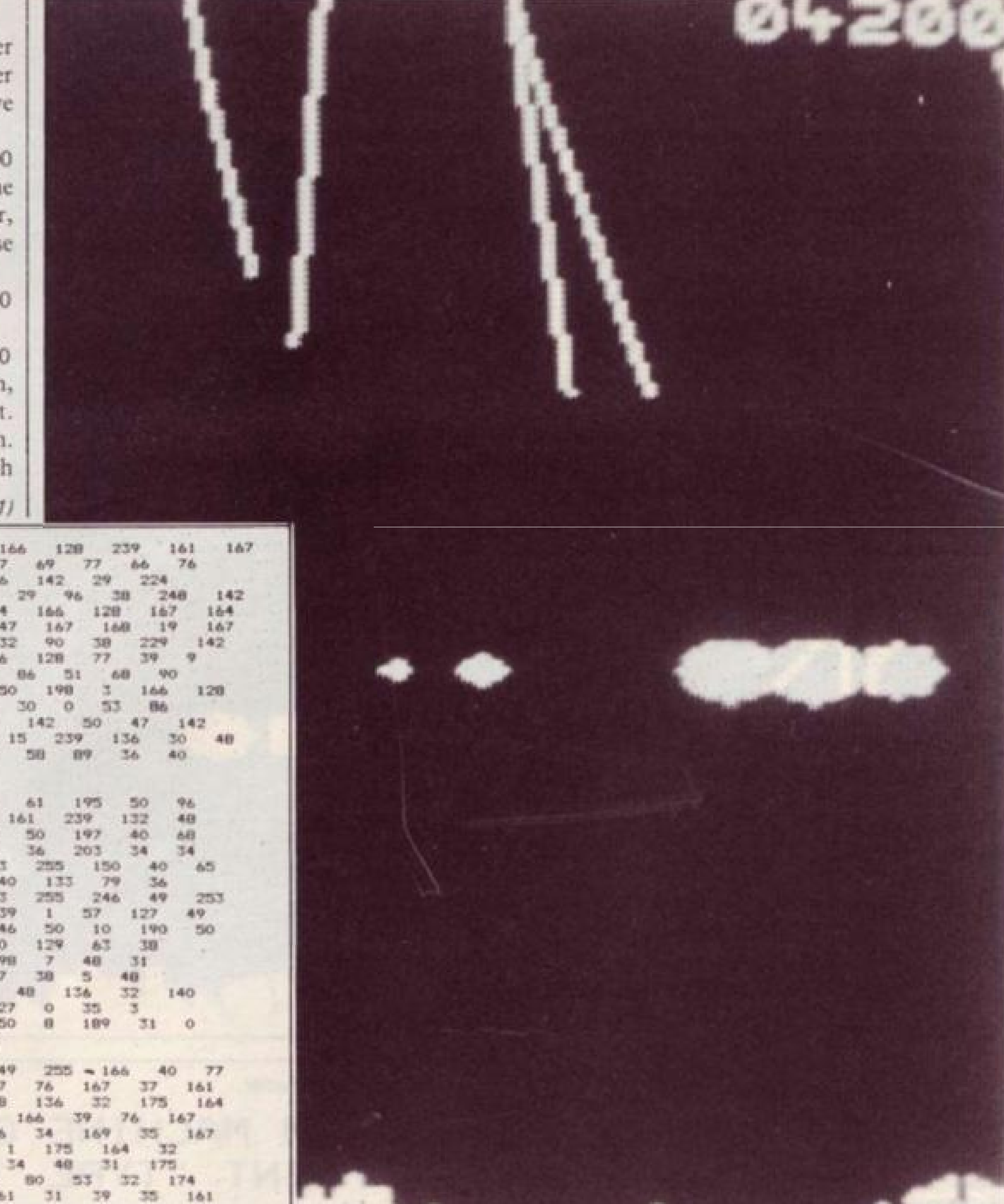
CSAVEM"COM1(M)",&H1E00,&H2910,&H1E00

and then

CSAVEM"COM2(m)",&H3000,&H34FF,&H3000

Now type in the Basic Controller Program, once again Save this on tape, and then Run it. Full instructions are given in the program. There are a few interesting addresses which

(continued on page 141)




```
7680   142  50   16   198  10   238  129  166  128  239  161  167
7692   164  49   168  30   90   38   242  57   69   77   66   76
7704   69   99   0    30   54   0    2    130  16   142  29   224
7716   204  170  170  237  163  16   140  29   96   38   248  142
7728   52   164  16   142  28   226  198  4    166  128  167  164
7740   167  36   167  40   167  44   167  47   167  168  19   167
7752   168  23   167  168  27   49   168  32   90   38   229  142
7764   52   169  206  28   35   198  3    166  128  77   39   9
7776   49   196  52   86   189  30   0    53   86   51   68   90
7788   38   237  142  52   172  206  28   50   198  3    166  128
7800   77   39   9    49   196  52   86   189  30   0    53   86
7812   51   68   90   38   237  198  13   16   142  50   47   142
7824   28   96   238  161  239  132  239  15   239  136  30   48
7836   136  32   90   38   241  57   65   34   58   89   36   40
7848   55   41   203

7935   68   52   32   134  16   246  50   10   61   195  50   96
7947   31   2    190  50   8    198  8    238  161  239  132  48
7959   136  32   90   38   246  53   32   57   50   197  40   68
7971   204  52   55   57   41   58   133  65   36   203  34   34
7983   191  51   48   58   132  79   36   203  255  150  40   65
7995   36   44   49   41   0    31   145  0    40   133  79   36
8007   203  34   65   34   191  65   68   203  255  246  49   253
8019   92   247  49   253  241  49   252  39   1    57   127  49
8031   253  189  128  18   182  1    92   246  50   10   190  50
8043   8    77   38   5    90   43   13   32   20   129  63   38
8055   16   92   193  8    39   8    32   9    198  7    48   31
8067   32   3    95   48   1    182  1    93   77   38   5    48
8079   136  224  32   7    129  63   38   3    48   136  32   140
8091   6    0    36   3    48   136  64   140  27   0    35   3
8103   48   136  192  247  50   10   191  50   8    189  31   0
8115   57   59   58   133  67   89   202  48

8190   49   255  16   142  50   225  127  49   255 ~ 166  40   77
8202   39   74   16   43   255  252  166  37   76   167  37   161
8214   36   45   61   111  37   174  164  48   136  32   175  164
8226   140  29   96   37   3    189  33   32   166  39   76   167
8238   39   161  38   47   32   111  39   166  34   169  35   167
8250   34   129  7    47   8    111  34   48   1    175  164  32
8262   12   129  0    44   8    134  7    167  34   48   31   175
8274   164  189  33   0    52   32   189  38   80   53   32   174
8286   164  134  255  161  1    39   39   161  31   39   35   161
8298   136  224  39   30   161  136  224  39   25   49   41   246
8310   49   255  92   247  49   255  241  49   254  47   134  182
8322   49   243  177  49   254  16   47   255  117  57   134  10
8334   124  49   246  177  49   246  46   25   127  49   246  124
8346   49   245  177  49   245  46   14   127  49   245  124  49
8358   244  177  49   244  46   3    127  49   244  124  49   243
8370   48   136  32   175  164  189  33   249  142  0    240  198
8382   1    189  40   208  48   31   38   247  32   173  65   36
8394   41

8445   78   36   203  142  50   0    230  34   58   166  132  170
8457   180  167  180  57   55   55   58   141  77   36   44   78
8469   36   44   72   36   58   133  77   78   36   203  77   198
8481   11   174  164  206  52   175  166  192  167  132  48   136
8493   224  90   38   246  189  33   249  124  49   243  142  0
8505   1    198  1    189  40   208  48   1    140

8683   202  203  34   51   34   191  78   40   51   41   203  255
8695   143  40   174  164  48   136  224  175  164  111  40   174
8707   164  48   136  224  175  164  166  39   74   167  39   129
8719   0    44   34   166  38   167  39   166  34   160  35   167
8731   34   129  8    43   8    111  34   48   1    175  164  32
8743   12   129  0    42   8    134  7    167  34   48   31   175
8755   164  140  6    0    34   1    57   142  50   0    230  34
8767   58   166  180  170  132  160  132  167  180  32   184  57
8779   38   190  49   250  48   1    191  49   250  188  49   57
8791   39   3    126  35   0    127  49   250  127  49   251  16
8803   142  52   191  198  10   166  36   77   39   8    49   37
8815   90   38   246  126  35   0    182  255  0    129  253  38
8827   41   246  49   247  93   39   9    122  49   247  32   33
8839   129  251  38   11   246  49   248  93   39   9    122  49
8851   248  32   18   129  239  38   11   246  49   249  93   39
8863   5    122  49   249  32   3    126  35   0    190  50   8
8875   175  164  182  50   10   167  34   134  1    167  36   126
8887   35   0    49   188  86   58   79   36   203  255  149  40
8899   78   40   73   41   41   58

8955   65   36   41   202  49   246  52   188  92   247  52   188
8967   241  52   187  39   3    126  31   80   127  52   188  246
8979   52   190  241  52   189  46   6    92   247  52   190  32
8991   3    127  52   190  134  5    246  52   190  61   195  52
9003   191  31   2    166  36   77   39   10   166  35   129  14
9015   45   7    111  35   111  36   126  31   80   76   167  35
9027   198  20   61   195  36   0    31   1    206  38   0    236
9039   129  237  196  111  66   51   67   17   131  38   30   37
9051   242  230  34   93   39   17   206  38   0    134  10   100
9063   192  102  192  102  192  74   38   247  90   38   239  174
9075   164  206  38   0    166  35   129  8    45   20   166  192
9087   167  128  236  193  237  129  48   136  29   17   131  38
9099   30   37   239  126  31   80   166  192  170  132  167  128
9111   236  193  170  132  234  1    237  129  48   136  29   17
9123   131  38   30   37   233  126  31   80   53   41   41   41
9135   58   129  188  51   48   0    35   220
```

```
9210   58   78   49   203  48   58   0    0    0    0    0    0
9222   0    0    0    0    0    0    0    0    0    0    0    0
9234   0    0    0    0    0    0    0    0    0    0    3    128
9246   0    0    0    0    0    0    0    0    0    0    0    0
9258   0    0    0    0    1    0    7    192  1    0    0    0
9270   0    0    0    0    0    0    0    0    0    0    1    0
9282   7    192  15   224  7    192  1    0    0    0    0    0
9294   0    0    0    0    1    0    7    192  15   224  31   240
9306   15   224  7    192  1    0    0    0    0    0    0    0
9318   7    192  15   224  31   240  63   248  31   240  15   224
9330   7    192  0    0    0    0    1    0    31   240  31   240
9342   63   248  127  252  63   248  31   240  31   240  1    0
9354   0    0    15   224  63   248  127  252  127  252  255  254
9366   127  252  127  252  63   248  15   224  1    0    15   224
9378   63   248  127  252  127  252  255  254  127  252  127  252
9390   63   248  15   224  1    0    1    0    31   240  31   240
9402   63   248  127  252  63   248  31   240  31   240  1    0
9414   0    0    0    0    7    192  15   224  31   240  63   248
9426   31   240  15   224  7    192  0    0    0    0    0    0
9438   1    0    7    192  15   224  31   240  15   224  7    192
9450   1    0    0    0    0    0    0    0    0    0    1    0
9462   7    192  15   224  7    192  1    0    0    0    0    0
9474   0    0,   0    0    0    0    0    0    1    0    7    192
9486   1    0    0    0    0    0    0    0    0    0    0    0
9498   0    0    0    0    0    0    0    0    0    0    0    0
9510   0    0    0    0    0    0    0    84   36   203  255  152
9522   40   79   36   44   84   89   44   50   41   58   133  77
9534   36

9805   57   54   0    190  49   235  48   1    191  49   235  188
9817   49   231  39   3    126  34   76   127  49   235  127  49
9829   236  142  85   85   198  28   224  39   5    127  49   247
9841   32   42   95   182  49   247  130  10   43   3    92   32
9853   249  247  49   241  134  10   61   242  49   247  80   247
9865   49   242  246  49   241  206  29   0    189  40   0    246
9877   49   242  206  29   1    189  40   0    142  85   85   188
9889   28   239  39   5    127  49   248  32   42   95   182  49
9901   248  130  10   43   3    92   32   249  247  49   241  134
9913   10   61   242  49   248  80   247  49   242  246  49   241
9925   206  29   15   189  40   0    246  49   242  206  29   16
9937   189  40   0    142  85   85   188  28   254  39   5    127
9949   49   249  32   42   95   182  49   249  130  10   43   3
9961   92   32   249  247  49   241  134  10   61   242  49   249
9973   80   247  49   242  246  49   241  206  29   30   189  40
9985   0    246  49   242  206  29   31   189  40   0    246  49
9997   244  206  6    27   189  40   0    246  49   245  206  6
10009  28   189  40   0    246  49   246  206  6    29   189  40
10021  0    95   206  6    30   189  40   0    95   206  6    31
10033  189  40   0    126  34   76   78   40   48   41   203
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(listing continued on page 141)

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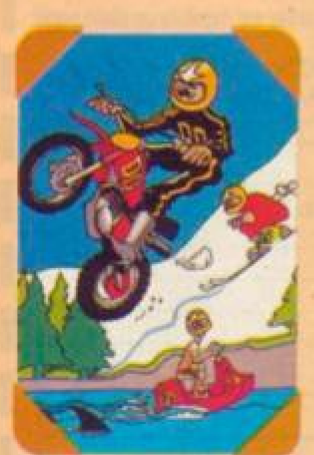
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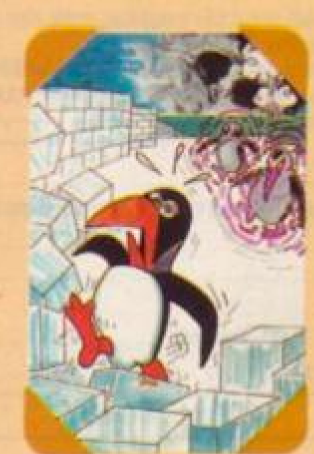
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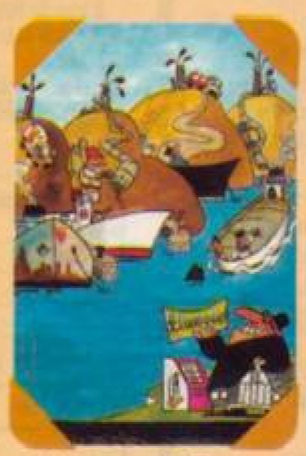
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GAMES DESIGNER No expert programming knowledge needed to create your own SPRITE-BASED MACHINE-CODE ARCADE GAMES with this program. EIGHT DEMO GAMES included: 4 written by amateurs! Clear 20-page manual. Design your own aliens, backgrounds, sound, quickly, easily - then save the joystick-option games you've made! (Quicksilva) 48K SPECTRUM £14.95.

MANIC MINER *"Certainly the best arcade game around for the Spectrum." (PopCompWkly)* Based on the USA arcade chart-topper 'MINER 2049er'. Superb graphics and sound as you search through 20 screens - each one a different arcade game. 20 screen demo mode: good jokes. Kempston joysticks. (Bug-Byte) 48K SPECTRUM: £5.95.

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(continued from page 136)

you may like to play around with:

Address	Explanation	Range	Default
&H34BD	Maximum number of explosions on screen at same time	1-10	9
&H34BB	Speed of explosions	1-255	51
&H31FC	Speed of light	1-255	50
&H31FE	Number of missiles minus one	2-49	

Every time you wish to play the game type and Enter

PCLEAR 8

followed by ;

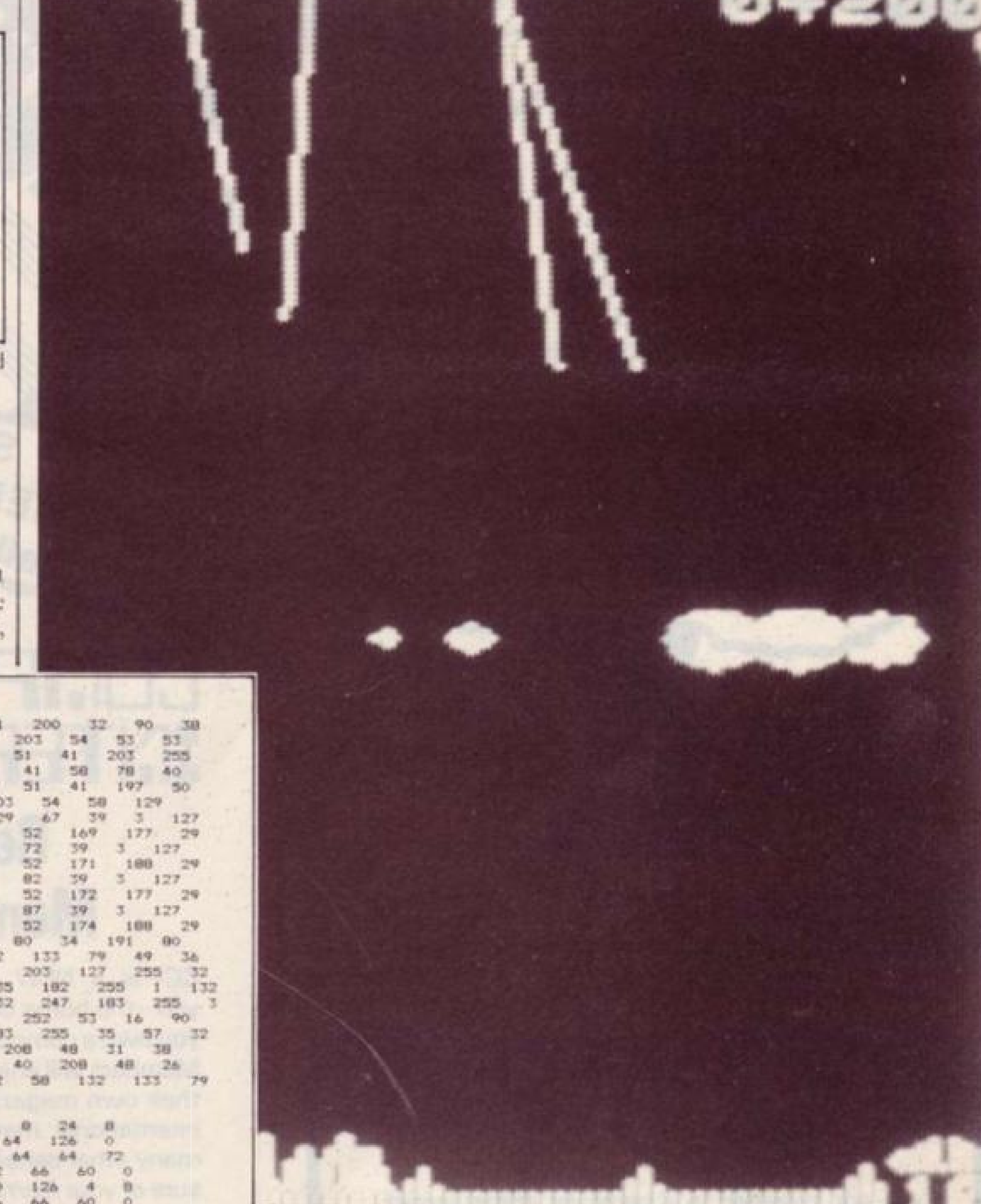
CLOADM

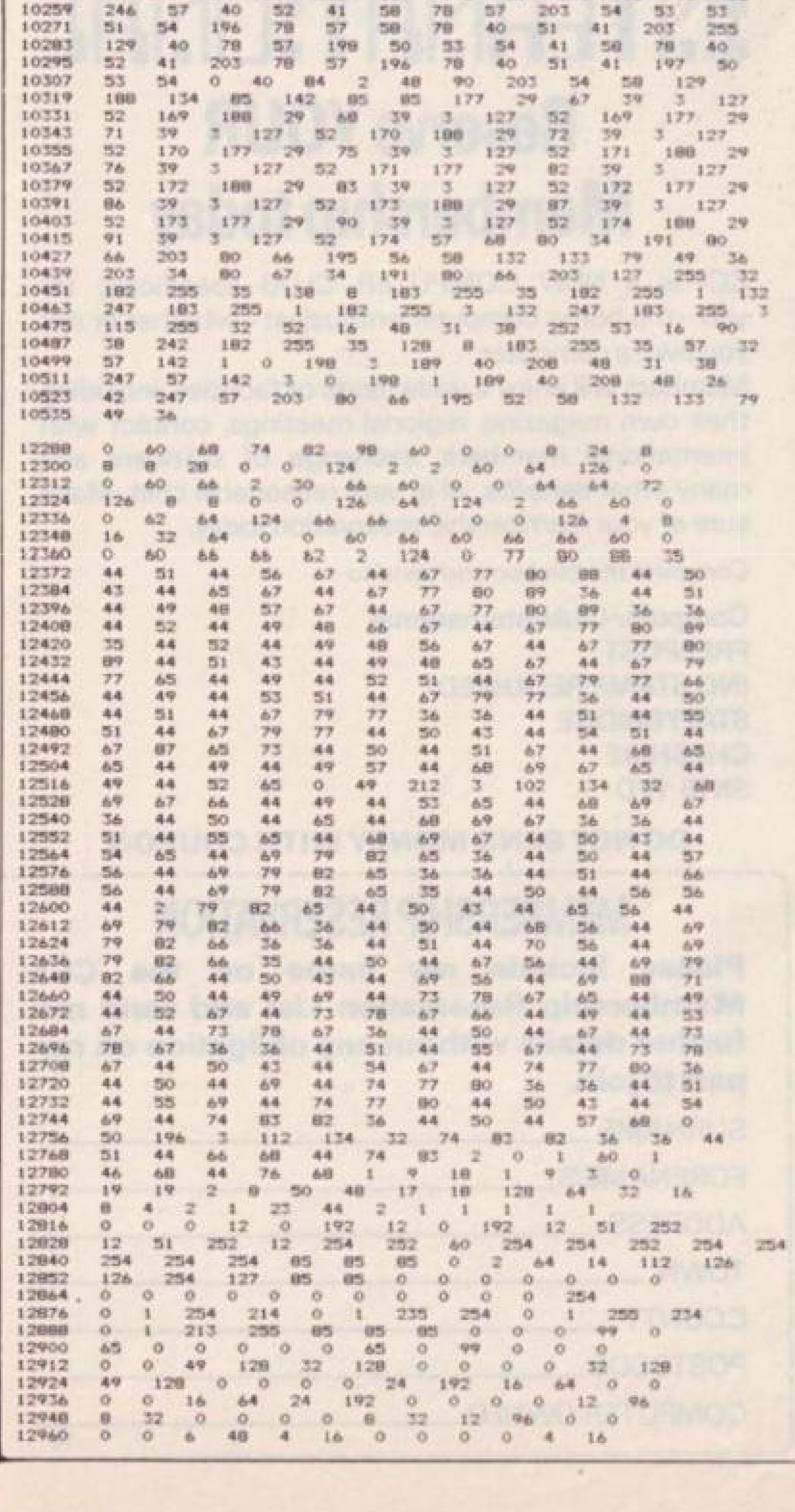
It is

CLOADM

again if you Saved the code in two parts.

If you do not feel like staying up all night typing in the machine code then copies are obtainable from me at 133 Bentswood Road, Haywards Heath, Sussex RH16 3PP for £3.

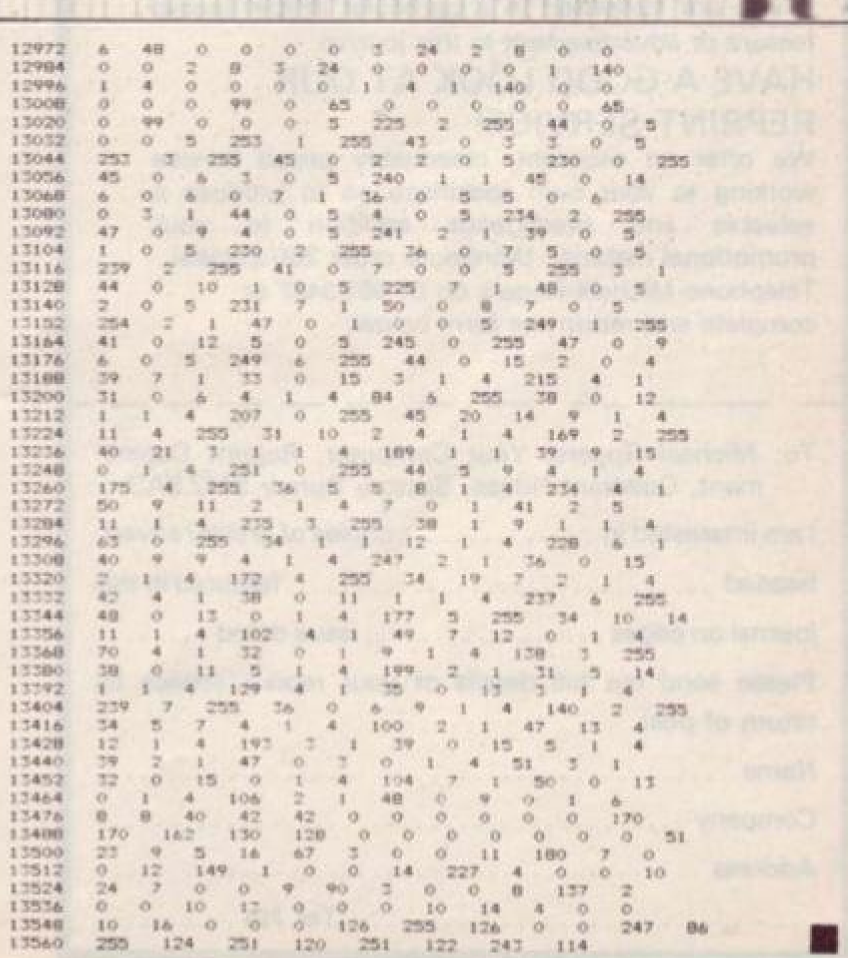




(listing continued from page 136)

```
10247   1  198    8  166  128  167  196   51  200   32   90   38
10259 246   57   40   52   41   58   78   57  203   54   53   53
10271  51   54  196   78   57   58   78   40   51   41  203  255
10283 129   40   78   57  198   50   53   54   41   58   78   40
10295  52   41  203   78   57  196   78   40   51   41  197   50
10307  53   54    0   40   84    2   48   90  203   54   58  129
10319 188  134   85  142   85   85  177   29   67   39    3  127
10331  52  169  188   29   68   39    3  127   52  169  177   29
10343  71   39    3  127   52  170  188   29   72   39    3  127
10355  52  170  177   29   75   39    3  127   52  171  188   29
10367  76   39    3  127   52  171  177   29   82   39    3  127
10379  52  172  188   29   83   39    3  127   52  172  177   29
10391  86   39    3  127   52  173  188   29   87   39    3  127
10403  52  173  177   29   90   39    3  127   52  174  188   29
10415  91   39    3  127   52  174   57   68   80   34  191   80
10427  66  203   80   66  195   56   58  132  133   79   49   36
10439 203   34   80   67   34  191   80   66  203  127  255   32
10451 182  255   35  138    8  183  255   35  182  255    1  132
10463 247  183  255    1  182  255    3  132  247  183  255    3
10475 115  255   32   52   16   48   31   38  252   53   16   90
10487  38  242  182  255   35  128    8  183  255   35   57   32
10499  57  142    1    0  198    3  189   40  208   48   31   38
10511 247   57  142    3    0  198    1  189   40  208   48   26
10523  42  247   57  203   80   66  195   52   58  132  133   79
10535  49   36

12288   0   60   68   74   82   98   60    0    0    8   24    8
12300   8    8   28    0    0  124    2    2   60   64  126    0
12312   0   60   66    2   30   66   60    0    0   64   64   72
12324 126    8    8    0    0  126   64  124    2   66   60    0
12336   0   62   64  124   66   66   60    0    0  126    4    8
12348  16   32   64    0    0   60   66   60   66   66   60    0
12360   0   60   66   66   62    2  124    0   77   80   88   35
12372  44   51   44   56   67   44   67   77   80   88   44   50
12384  43   44   65   67   44   67   77   80   89   36   44   51
12396  44   49   48   57   67   44   67   77   80   89   36   36
12408  44   52   44   49   48   66   67   44   67   77   80   89
12420  35   44   52   44   49   48   56   67   44   67   77   80
12432  89   44   51   43   44   49   48   65   67   44   67   79
12444  77   65   44   49   44   52   51   44   67   79   77   66
12456  44   49   44   53   51   44   67   79   77   36   44   50
12468  44   51   44   67   79   77   36   36   44   51   44   55
12480  51   44   67   79   77   44   50   43   44   54   51   44
12492  67   87   65   73   44   50   44   51   67   44   68   65
12504  65   44   49   44   49   57   44   68   69   67   65   44
12516  49   44   52   65    0   49  212    3  102  134   32   68
12528  69   67   66   44   49   44   53   65   44   68   69   67
12540  36   44   50   44   65   44   68   69   67   36   36   44
12552  51   44   55   65   44   68   69   67   44   50   43   44
12564  54   65   44   69   79   82   65   36   44   50   44   57
12576  56   44   69   79   82   65   36   36   44   51   44   66
12588  56   44   69   79   82   65   35   44   50   44   56   56
12600  44    2   79   82   65   44   50   43   44   65   56   44
12612  69   79   82   66   36   44   50   44   68   56   44   69
12624  79   82   66   36   36   44   51   44   70   56   44   69
12636  79   82   66   35   44   50   44   67   56   44   69   79
12648  82   66   44   50   43   44   69   56   44   69   88   71
12660  44   50   44   49   69   44   73   78   67   65   44   49
12672  44   52   67   44   73   78   67   66   44   49   44   53
12684  67   44   73   78   67   36   44   50   44   67   44   73
12696  78   67   36   36   44   51   44   55   67   44   73   78
12708  67   44   50   43   44   54   67   44   74   77   80   36
12720  44   50   44   69   44   74   77   80   36   36   44   51
12732  44   55   69   44   74   77   80   44   50   43   44   54
12744  69   44   74   83   82   36   44   50   44   57   68    0
12756  50  196    3  112  134   32   74   83   82   36   36   44
12768  51   44   66   68   44   74   83    2    0    1   60    1
12780  46   68   44   76   68    1    9   18    1    9    3    0
12792  19   19    2    8   50   48   17   18  128   64   32   16
12804   8    4    2    1   23   44    2    1    1    1    1    1
12816   0    0    0   12    0  192   12    0  192   12   51  252
12828  12   51  252   12  254  252   60  254  254  252  254  254  254
12840 254  254  254   85   85   85    0    2   64   14  112  126
12852 126  254  127   85   85    0    0    0    0    0    0    0
12864   0    0    0    0    0    0    0    0    0    0    0  254
12876   0    1  254  214    0    1  235  254    0    1  255  234
12888   0    1  213  255   85   85   85    0    0    0   99    0
12900  65    0    0    0    0    0   65    0   99    0    0    0
12912   0    0   49  128   32  128    0    0    0    0   32  128
12924  49  128    0    0    0    0   24  192   16   64    0    0
12936   0    0   16   64   24  192    0    0    0    0   12   96
12948   8   32    0    0    0    0    8   32   12   96    0    0
12960   0    0    6   48    4   16    0    0    0    0    4   16
```



```
12972   6   48    0    0    0    0    3   24    2    8    0    0
12984   0    0    2    8    3   24    0    0    0    0    1  140
12996   1    4    0    0    0    0    1    4    1  140    0    0
13008   0    0    0   99    0   65    0    0    0    0    0   65
13020   0   99    0    0    0    5  225    2  255   44    0    5
13032   0    0    5  253    1  255   43    0    3    3    0    5
13044 253    3  255   45    0    2    2    0    5  230    0  255
13056  45    0    6    3    0    5  240    1    1   45    0   14
13068   6    0    6    0    7    1   36    0    5    5    0    6
13080   0    3    1   44    0    5    8    0    5  234    2  255
13092  47    0    9    4    0    5  241    2    1   39    0    5
13104   1    0    5  230    2  255   36    0    7    5    0    5
13116 239    2  255   41    0    7    0    0    5  255    3    1
13128  44    0   10    1    0    5  225    7    1   48    0    5
13140   2    0    5  231    7    1   50    0    8    7    0    5
13152 254    2    1   47    0    1    0    0    5  249    1  255
13164  41    0   12    5    0    5  245    0  255   47    0    9
13176   6    0    5  249    6  255   44    0   15    2    0    4
13188  39    7    1   33    0   15    3    1    4  215    4    1
13200  31    0    6    4    1    4   84    6  255   38    0   12
13212   1    1    4  207    0  255   45   20   14    9    1    4
13224  11    4  255   31   10    2    4    1    4  169    2  255
13236  40   21    3    1    1    4  189    1    1   39    9   15
13248   0    1    4  251    0  255   44    5    9    4    1    4
13260 175    4  255   36    5    5    8    1    4  234    4    1
13272  50    9   11    2    1    4    7    0    1   41    2    5
13284  11    1    4  235    3  255   38    1    9    1    1    4
13296  63    0  255   34    1    1   12    1    4  228    6    1
13308  40    9    9    4    1    4  247    2    1   36    0   15
13320   2    1    4  172    4  255   34   19    7    2    1    4
13332  42    4    1   38    0   11    1    1    4  237    6  255
13344  48    0   13    0    1    4  177    5  255   34   10   14
13356  11    1    4  102    4    1   49    7   12    0    1    4
13368  70    4    1   32    0    1    9    1    4  138    3  255
13380  38    0   11    5    1    4  199    2    1   31    5   14
13392   1    1    4  129    4    1   35    0   13    3    1    4
13404 239    7  255   36    0    6    9    1    4  140    2  255
13416  34    5    7    4    1    4  100    2    1   47   13    4
13428  12    1    4  193    3    1   39    0   15    5    1    4
13440  39    2    1   47    0    3    0    1    4   51    3    1
13452  32    0   15    0    1    4  104    7    1   50    0   13
13464   0    1    4  106    2    1   48    0    9    0    1    6
13476   8    8   40   42   42    0    0    0    0    0    0  170
13488 170  162  130  128    0    0    0    0    0    0    0   51
13500  23    9    5   16   67    3    0    0   11  180    7    0
13512   0   12  149    1    0    0   14  227    4    0    0   10
13524  24    7    0    0    9   90    3    0    0    8  137    2
13536   0    0   10   12    0    0    0   10   14    4    0    0
13548  10   16    0    0    0  126  255  126    0    0  247   86
13560 255  124  251  120  251  122  243  114
```

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ZX-81 DRAW

Figure 1.

```
FD  36  30  96  16  04  FD  36
30  A0  11  FF  FF  ED  4B  7B
40  78  FE  00  28  0C  CB  78
28  07  06  FF  A6  47  04  16
02  14  14  79  FE  00  28  0C
CB  79  28  07  0E  FF  A9  4F
0C  18  02  1C  1C  79  B8  30
06  69  D5  AF  5F  18  07  61
00  68  41  D5  16  00  60  78
1F  85  38  03  BC  38  07  94
4F  D9  C1  C5  18  05  4F  4F
D5  D9  C1  2A  36  40  78  84
47  79  3C  85  38  0E  28  0E
3D  4F  CD  62  0B  D9  79  10
D8  D1  CF  FF  28  F2  CF  0A
```

Hexloader.

```
   1 REM ........................................................................................................................
  10 LET A$=""
  20 FOR A=16514 TO 16633
  30 IF A$="" THEN INPUT A$
  40 POKE A,16*CODE A$+CODE A$(2
)-476
  50 PRINT A$( TO 2);"  ";
  60 LET A$=A$(3 TO )
  70 NEXT A
  80 POKE 16510,0
  90 POKE 16646,118
```

David King illustrates a draw and undraw routine for the ZX-81. It is similar to that provided on the Spectrum.

Figure 2.

```
   0 REM CLEAR OK■/▪ CLEAR OK■)
COPY COPY GOSUB ??RND? RETURN  C
£ACS ?C■▪ COPY ■?▪ /▪==? RETURN
C£ACS ?C■: COPY ■?£/▪00?■K▪?STR$
■?/■■ ?INKEY$STR$ - ??3■S■■S■■?
 OR AT VAL /■??STR$ OR AT EORND?
■??U ■S:C:X?LN ■" OR ?(**SGN INT
COPY C PAUSE INT ■
```

Figure 3.

```
   0 REM CLEAR OK■/▪ CLEAR OK■)
COPY COPY GOSUB ??RND? RETURN  C
£ACS ?C■▪ COPY ■?▪ /▪==? RETURN
C£ACS ?C■: COPY ■?£/▪00?■K▪?STR$
■?/■■ ?INKEY$STR$ - ??3■S■■S■■?
 OR AT VAL /■??STR$ OR AT EORND?
■??U ■S:C:X?LN ■" OR ?(**SGN INT
COPY C PAUSE INT ■
  10 PLOT 0,0
  20 POKE 16507,63
  30 POKE 16508,43
  40 RAND USR 16514
```

Figure 4.

```
   0 REM CLEAR OK■/▪ CLEAR OK■)
COPY COPY GOSUB ??RND? RETURN  C
£ACS ?C■▪ COPY ■?▪ /▪==? RETURN
C£ACS ?C■: COPY ■?£/▪00?■K▪?STR$
■?/■■ ?INKEY$STR$ - ??3■S■■S■■?
 OR AT VAL /■??STR$ OR AT EORND?
■??U ■S:C:X?LN ■" OR ?(**SGN INT
COPY C PAUSE INT ■
  10 FOR X=-30 TO 30 STEP 30
  20 FOR Y=-20 TO 20 STEP 20
  30 PLOT 30,20
  40 POKE 16507,X
  50 POKE 16508,Y
  60 IF NOT X AND NOT Y THEN GOT
O 80
  70 RAND USR 16514
  80 NEXT Y
  90 NEXT X
```

Figure 5.

```
   0 REM CLEAR OK■/▪ CLEAR OK■)
COPY COPY GOSUB ??RND? RETURN  C
£ACS ?C■▪ COPY ■?▪ /▪==? RETURN
C£ACS ?C■: COPY ■?£/▪00?■K▪?STR$
■?/■■ ?INKEY$STR$ - ??3■S■■S■■?
 OR AT VAL /■??STR$ OR AT EORND?
■??U ■S:C:X?LN ■" OR ?(**SGN INT
COPY C PAUSE INT ■
  10 LET C=8
  20 FOR A=0 TO 6 STEP .2
  30 PLOT 25,20
  40 POKE 16507,COS A*C
  50 POKE 16508,SIN A*C
  60 RAND USR 16514
  70 LET C=C+.75
  80 NEXT A
  90 PRINT AT 5,20;"A SHELL"
```

Figure 6.

```
   0 REM CLEAR OK■/▪ CLEAR OK■)
COPY COPY GOSUB ??RND? RETURN  C
£ACS ?C■▪ COPY ■?▪ /▪==? RETURN
C£ACS ?C■: COPY ■?£/▪00?■K▪?STR$
■?/■■ ?INKEY$STR$ - ??3■S■■S■■?
 OR AT VAL /■??STR$ OR AT EORND?
■??U ■S:C:X?LN ■" OR ?(**SGN INT
COPY C PAUSE INT ■
  10 FOR A=16514 TO 16633
  20 LET B=PEEK A
  30 PRINT CHR$ INT (B/16+28);CH
R$ INT (B-16*INT (B/16)+28);" "
;
  40 INPUT A$
  50 IF A$="" THEN GOTO 70
  60 POKE A,16*CODE A$+CODE A$(2
)-476
  70 NEXT A
```

WHEN THE ZX-80 first came out in 1980 with its 4K Basic ROM, Sinclair announced it would soon be producing an optional 8K drop-in replacement chip, which would give moving graphics, trig functions, all keywords direct from the keyboard, plus inverse graphics, and 8½ digit floating arithmetic. However it also would have Read, Restore and Data, plus Draw and Undraw, and a number of other features.

Very soon after Sinclair launched the new 8K ROM, it decided to delay introduction of these features and design a printer. The new printer routines necessitated the space the extra facilities took up, and so when the 8K ROM finally came out Draw and Undraw were not there. In addition, Sinclair designed a completely new computer to go around the 8K ROM, which it called the ZX-81. It had a steady display which was sadly lacking on the ZX-80 with 8K ROM.

I decided it would not be all that difficult to give the ZX-81 Draw and Undraw facilities like those on the Spectrum. Useful routines which I might want to include in Basic programs I find easiest to place in Rem statements. This Draw routine draws as straight a line as possible in pixels from the last point plotted to a relative position indicated by the Vectors Poked into addresses 16507 and 16508. There are only two USR addresses to remember, one for Draw and one for Undraw, just as there are Plot and Unplot.

Type the Hexloader into your ZX-81, line 1 contains 120 full-stops.

Then type Run Newline and enter the 120 Hexcodes in figure 1. You can enter them singly, followed by Newline, or enter them in batches, then Newline. Try not to make any mistakes, even one mistake may make the routine crash.

When the report code 0/90 appears type 10 Newline. Line 90 ensures that when you type 10 Newline, lines 10 to 90 are all deleted, we no longer need the Hexloader part of the program. You should now have an uneditable line 0 which looks like that in figure 2 — chaos.

Line 0 contains the Draw routine, the characters you can see are the equivalent of the hexcodes you entered. At this point Save the Rem statement on tape.

When you have checked that it has Saved properly add lines 10 to 40 to your Rem statement, and type Run Newline — see figure 3.

If all is well a diagonal line will be drawn from the bottom left-hand corner of the screen to the top right-hand corner.

Notice that the numbers in a Draw statement can be negative, although those in a Plot statement cannot. If x (16507) is negative the finishing place will be x pixels to the left, instead of to the right. If x is zero the line will be vertical. If y (16508) is negative the finishing place will be y pixels down, instead of up. If y is zero the line will be horizontal — see figure 4.

One thing to ensure is that x and y are not both zero, this causes the Draw routine to get a bit muddled, however Break brings it out of its misery.

(continued on next page)

Figure 7.

```
   0 REM CLEAR OK■/▪ CLEAR OK■)
COPY COPY GOSUB ??RND? RETURN  C
£ACS ?C■▪ COPY ■?▪ /▪==? RETURN
C£ACS ?C■: COPY ■?£/▪00?■K▪?STR$
■?/■■ ?INKEY$STR$ - ??3■S■■S■■?
 OR AT VAL /■??STR$ OR AT EORND?
■??U ■S:C:X?LN ■" OR ?(**SGN INT
COPY C PAUSE INT ■
  10 PLOT 40,10
  20 POKE 16507,-30
  30 POKE 16508,20
  40 RAND USR 16514
```

Figure 8.

```
   0 REM CLEAR OK■/▪ CLEAR OK■)
COPY COPY GOSUB ??RND? RETURN  C
£ACS ?C■▪ COPY ■?▪ /▪==? RETURN
C£ACS ?C■: COPY ■?£/▪00?■K▪?STR$
■?/■■ ?INKEY$STR$ - ??3■S■■S■■?
 OR AT VAL /■??STR$ OR AT EORND?
■??U ■S:C:X?LN ■" OR ?(**SGN INT
COPY C PAUSE INT ■
  10 PLOT 31,21
  20 POKE 16507,15
  30 POKE 16508,20
  40 RAND USR 16514
```

(continued from previous page)

Try the short programs for a demonstration of the ease with which graphics can be created.

If you do not get the required result — or the program crashes, you have probably made a mistake in entering the Hexcodes. Use the program in figure 6 to check through the Hexcodes. If you want to change an entry type in the correct Hexcode, then press Newline, otherwise press Newline on its own.

If you understand vector drawing, ignore this section. The statement Draw to draw a straight line on the Spectrum takes the form:

DRAW x,y

Using this program you have to Poke x and y into memory locations, in addition the Rand USR 16514 command does not set the Random seed. You could equally well use Print USR 16514 or Let A=USR 16514, and neither a number would be printed nor a value assigned to A; control is passed to the next line.

The starting place of the line is where the last Plot or Draw statement left off — this is called the Plot position; New resets it to the bottom left-hand corner (0,0) — and the finishing place is x pixels to the right of that and y pixels up. Notice that Draw on its own determines the length and direction of the line, but not its starting point.

You can experiment with a few Plot and Draw commands — see figures 7 and 8.

Figures 9 and 10 make use of the interference patterns between the individual pixels of lines to create interesting patterns.

Figure 11 draws a number of random direction lines, each leaving off from where the last ended.

As I mentioned earlier, it is also possible to Undraw as well as Draw lines. To Undraw lines use Rand USR 16520. The program in figure 12 illustrates this.

Figure 9.

```
  0 REM CLEAR QK▀/▪ CLEAR QK▀)
COPY COPY GOSUB ??RND? RETURN  C
£ACS ?C▀▀ COPY ▀?▪ /▪==? RETURN
C£ACS ?C▀: COPY ▀?£/▪00?▀K▀?STR$
▀?/▀▀ ?INKEY$STR$ - ??3▀S▀▀S▀▀?
 OR AT VAL /▀??STR$ OR AT E0RND?
▀??U▀S:C:X?LN ▀" OR ?(**SGN INT
COPY C PAUSE INT ▀
 10 FOR Y=0 TO 43 STEP 2
 20 PLOT 0,Y
 30 POKE 16507,63
 40 POKE 16508,43-Y*2
 50 RAND USR 16514
 60 NEXT Y
 70 FOR X=0 TO 63 STEP 4
 80 PLOT X,43
 90 POKE 16507,63-X*2
100 POKE 16508,-43
110 RAND USR 16514
120 NEXT X
```

Figure 10.

```
  0 REM CLEAR QK▀/▪ CLEAR QK▀)
COPY COPY GOSUB ??RND? RETURN  C
£ACS ?C▀▀ COPY ▀?▪ /▪==? RETURN
C£ACS ?C▀: COPY ▀?£/▪00?▀K▀?STR$
▀?/▀▀ ?INKEY$STR$ - ??3▀S▀▀S▀▀?
 OR AT VAL /▀??STR$ OR AT E0RND?
▀??U▀S:C:X?LN ▀" OR ?(**SGN INT
COPY C PAUSE INT ▀
 10 FOR Y=0 TO 43 STEP 2
 20 PLOT 0,0
 30 POKE 16507,63
 40 POKE 16508,Y
 50 RAND USR 16514
 60 PLOT 63,43
 70 POKE 16507,-63
 80 POKE 16508,-Y
 90 RAND USR 16514
100 NEXT Y
```



Figure 11.

```
  0 REM CLEAR QK▀/▪ CLEAR QK▀)
COPY COPY GOSUB ??RND? RETURN  C
£ACS ?C▀▀ COPY ▀?▪ /▪==? RETURN
C£ACS ?C▀: COPY ▀?£/▪00?▀K▀?STR$
▀?/▀▀ ?INKEY$STR$ - ??3▀S▀▀S▀▀?
 OR AT VAL /▀??STR$ OR AT E0RND?
▀??U▀S:C:X?LN ▀" OR ?(**SGN INT
COPY C PAUSE INT ▀
 10 PLOT 31,21
 20 FOR A=1 TO 25
 30 POKE 16507,INT (RND*63)-PEE
K 16438
 40 POKE 16508,INT (RND*43)-PEE
K 16439
 50 RAND USR 16514
 60 NEXT A
 70 CLS
 80 RUN
```

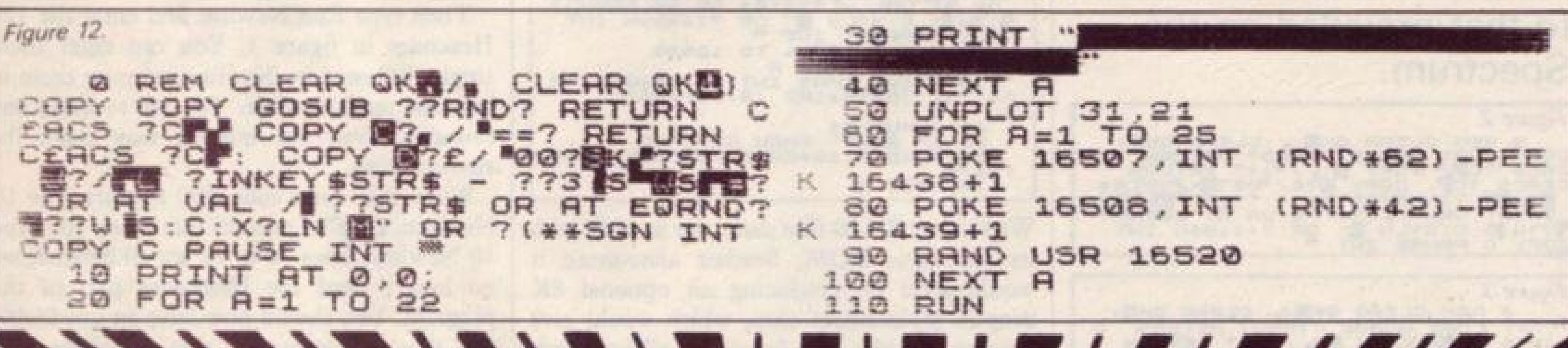


Figure 12.

```
  0 REM CLEAR QK▀/▪ CLEAR QK▀)
COPY COPY GOSUB ??RND? RETURN  C
£ACS ?C▀▀ COPY ▀?▪ /▪==? RETURN
C£ACS ?C▀: COPY ▀?£/▪00?▀K▀?STR$
▀?/▀▀ ?INKEY$STR$ - ??3▀S▀▀S▀▀?
 OR AT VAL /▀??STR$ OR AT E0RND?
▀??U▀S:C:X?LN ▀" OR ?(**SGN INT
COPY C PAUSE INT ▀
 10 PRINT AT 0,0;
 20 FOR A=1 TO 22
 30 PRINT "████████████████████████████████"
 40 NEXT A
 50 UNPLOT 31,21
 60 FOR A=1 TO 25
 70 POKE 16507,INT (RND*62)-PEE
K 16438+1
 80 POKE 16508,INT (RND*42)-PEE
K 16439+1
 90 RAND USR 16520
100 NEXT A
110 RUN
```

ZX 81 Spectrum Hardware

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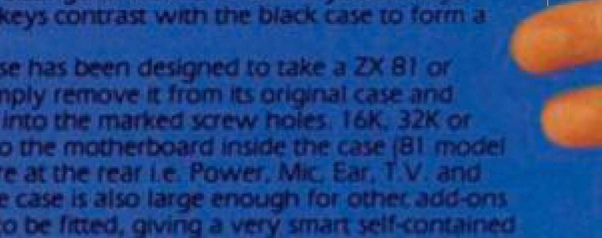
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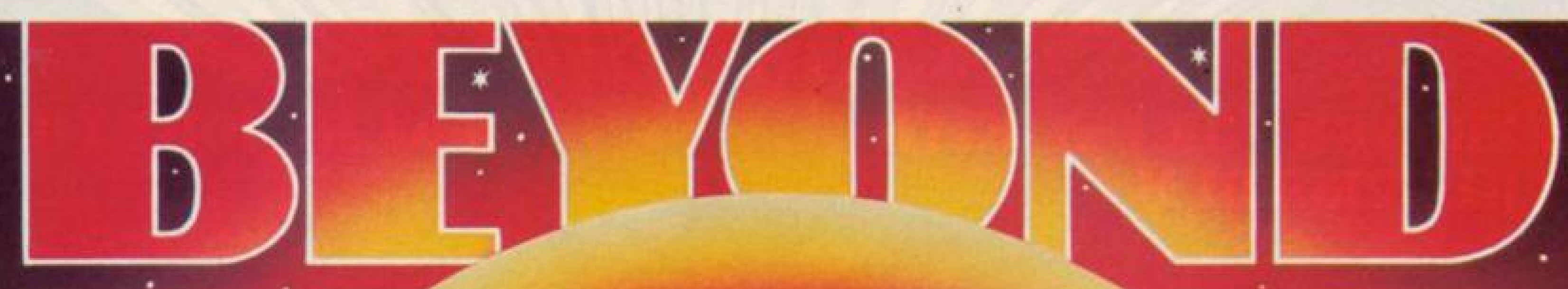
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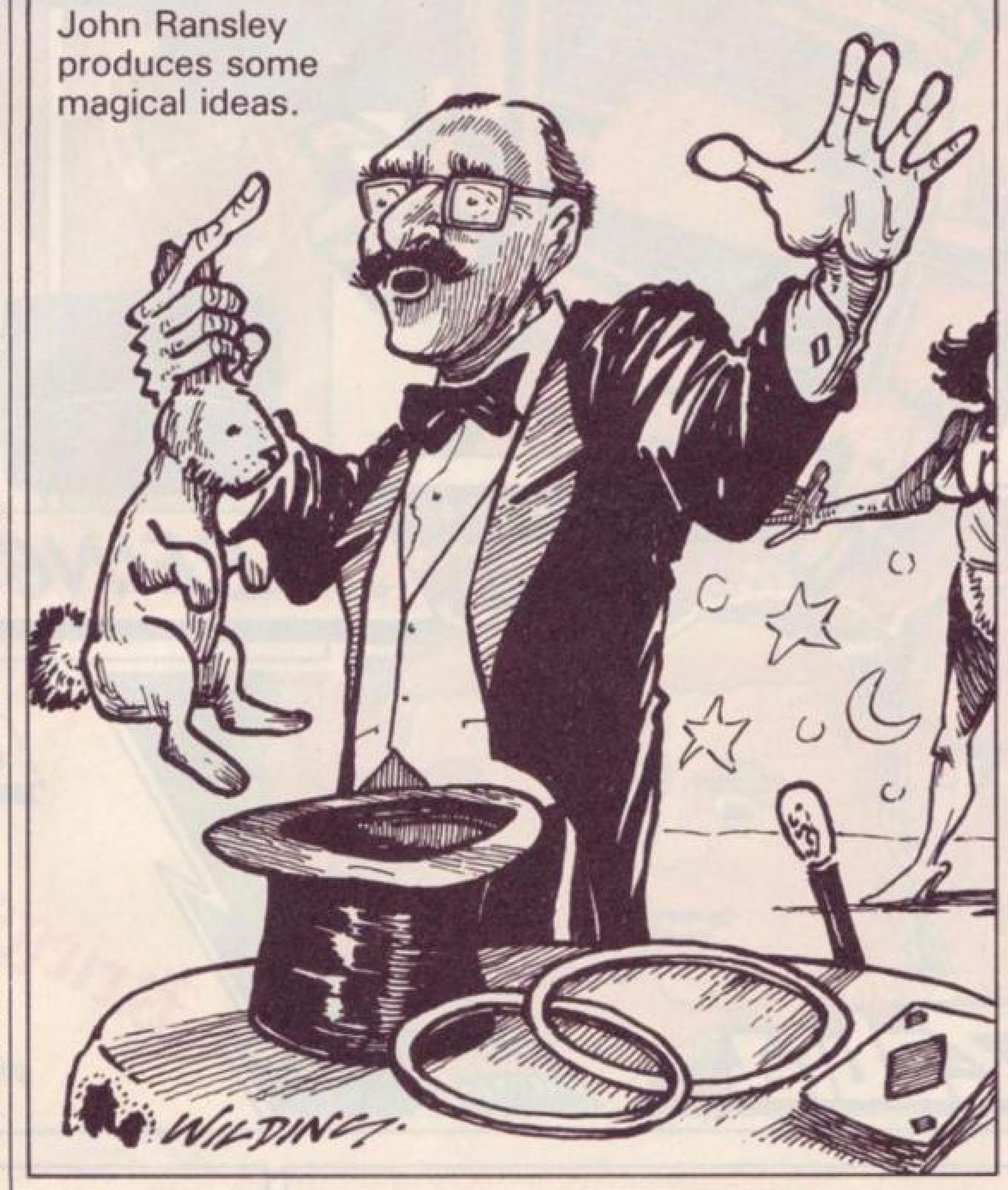
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TRICKS FOR YOUR VIC



John Ransley produces some magical ideas.

IF, LIKE ME, YOUR ownership of a Vic-20 is now into the second honeymoon stage, you will probably share my view that Commodore probably produces the best home computers in the world and definitely produces the worst documentation. So once you have recovered from the user's manual and have come to realise that there is more to Vic's life than jerky seagulls and a lot of bouncing balls, it soon dawns that Vic has some great little side orders if only you can find them on the menu.

The following collection comprises orginal thoughts and ideas I have culled from various sources and tailored to fit the Vic. I make no claims for the profoundness of these routines; but I believe many of them will hold a few surprises for you.

Nothing up my sleeve

■ There is a way of losing the ubiquitous question mark — and accompanying blank space — generated by use of an Input statement. It not only makes for tidier screen displays but also overcomes what is often an inappropriate character — for input screen prompts do not always take the form of a question. Here is one example of the technique:

```
10 OPEN 1,0:PRINT "TYPE YOUR NAME:";:
   INPUT #1, N$:PRINT
20 PRINT "THANK YOU "N$:CLOSE 1,0
```

■ Both Tab and SPC functions can be great timesavers; they do away with many of those cursor-right and cursor-left keystrokes for a start! But one of Vic-20's quirks is that it will not allow you to use either Tab or SPC as the *first* item preceding a Print statement. If necessary, introduce a dummy statement — such as a screen clear or cursor home — before calling Tab or SPC.

■ Could you use a random number generator that you can still influence to some extent? Try this:

```
10 X = INT(RND(1)*TI/200) + 1
20 PRINT X
30 GOTO 10
```

This routine produces three-digit numbers, using Vic-20's clock as a source of true randomisation. But change the divisor in line 10 to any lower than 150 and four-figure numbers will start to occur. Progressively reducing the divisor will relatively increase the chances of a four-digit result, which could be a useful quality in some games of chance. Similarly, a divisor of 1800 or more will produce only two and single digit random numbers.

■ When you are working on long programs — and particularly those involving a lot of text or figure work — it helps to introduce some blank spaces between significant blocks of the program, which will make for easier reading on screen or printout. The traditional way of doing this is to use one of the following forms:

```
10 REM
10 :
```

In other words, a Rem statement or single colon. Neither look particularly elegant, specially if you want to introduce several blanks at a time. But here is a routine that produces a line which is truly blank except for its number.

```
10 A LINE OF LISTING
20 ""(DELx2) (CTRL) (RVS ON) (SHIFT) -
   (SPACE) (RETURN)
30 A LINE OF LISTING
```

This may seem a little complicated, but it soon becomes second nature. In case line 20 fazes you, tackle it this way. Press the quotes key twice; press the Delete key twice — thus cursoring back over the quotes you have just entered; hold down the Control key and press Reverse On; hold down the Shift key and press the minus sign key; finally, hit Return. When you come to List these lines, only the line number will appear.

■ Remember the byte-saving — but often overlooked — value of using the integer qualifier % whenever setting up DIMs and arrays. For example, the following single line gobbles up no fewer than 637 bytes:

```
10 DIM A (10,10)
```

but squeeze a % after the A and this statement will then occupy just 275 bytes of memory. Prove this to yourself by Running both versions of the line and typing in direct mode ?FRE(X) and Return each time.

■ The Super Expander is one of the first add-ons the Vic-20 owner usually buys — not least because it is excellent value with its 3K of extra memory in addition to 27 new commands for handling hi-res graphics, music, joystick and other input values, and function key operations.

Before your very eyes

Although the Super Expander does not shift Vic's significant memory locations, there are times when you will want to take it out of service. But frequent removal and refitting won't do the delicate cartridge slot contacts —

or your temper — any good. There is an easier way. Simply typing, as a direct statement,

SYS 64850

disconnects the expander and returns Vic-20 to normal working. To re-enable the Super Expander, type

SYS 41031

Incidentally, it is sometimes important to remember that Vic's screen shrinks from 22x23 characters to only 20x20 when using the Super Expander's Graphic command.

■ Here are two ways of thwarting the pirates — more about others later. Location 775 usually holds a value of 199; so enter Poke 775,198 or Poke 775,200 as a direct or program statement and it becomes impossible to List any program in memory.

Better still, Poke 818,32 corrupts the Save operation; the screen prompt refers only to the data cassette's play key and even pressing record as well will not transfer the program. Remember to Poke 775,199 and 818,133 to restore the List and Save commands respectively.

■ Dim and Data statements are among the most common causes of bugs — and Vic's apparently imprecise error messages do not always help to pinpoint the real root. It helps to remember that an out-of-data error will misleadingly blame and identify the line containing the relevant Read statement.

Almost always, however, the real fault will be found in the Data line or lines; a comma missing or replaced by a full stop, an absent digit, or some other discrepancy between the number of items the Read statement states should be taken on board and the total making up all the Data lines.

Likewise, if a string is wrongly Dimensioned, the error prompt will cite the first line to call the variable concerned and not that containing the DIM statement itself.

■ Still on Data statements, some Vic programmers get annoyed at Vic's apparent inability to accommodate punctuation within them — a facility that is often useful when, say, constructing multi-clause sentences in adventure programs.

Data items can include punctuation — and can even take the form of a single comma or colon — provided each is enclosed in quote marks. Try this example:

```
10 READ A$
20 PRINT A$
30 DATA ",",",",",",",":"
40 GOTO 10
```

■ The way program lines whizz by when you List, even when the Ctrl key is held down, it is no wonder that debugging the Vic can be an even more brain-blustering experience than ever. You can watch your program lines building before your eyes with the direct mode statement Poke 37879,0 and Return before Listing.

Holding down the Ctrl or Shift key slows the scrolling speed even more. Poke 37879,69 restores normal operation.

■ Have you ever envied those colourful title screens used in commercial programs and thought to yourself, "There but for my 3.5K . . ."? Then you must have overlooked Vic's ability to generate and hold a display on your TV or monitor screen even when you have executed a New statement and wiped memory clean. Type this:

```
10 PRINT CLR
20 PRINT SPC (200)"YOUR TITLE SCREEN"
40 NEW:END
```

Type Run and hit Return — now List and you will see that memory is empty, ready for the main program, perhaps, which can be Loaded in the usual way.

Only, did you notice how the Ready prompt spoiled the display generated by line 20? You can lose it by adding the following line:

```
30 PRINT " CTRL WHITE "
```

Hit Stop and Restore to return normal visibility.

■ The potential of Vic's graphic set is easily underrated and under-utilised; it is difficult to imagine how they can be used to construct anything more than a square-eared cat or cuboid loco. The following little routine may help to set your imagination alight:

```
10 POKE 36879,25: PRINT "CLR"
20 CH=INT(RND(1)*254)+1
30 POKE 3687,CH
40 S=7678:C=INT(RND(1)*128)+1
50 P=INT(RND(1)*255)+1
60 X=INT(RND(1)*10)+1
70 N=INT(RND(1)*44)+1
80 FOR J=O TO 506 STEP N
90 POKE S+30720+X+J,C
100 POKE S+X+J,P:NEXT J
110 FOR D=1 TO 600:NEXT D
120 GOTO 20
```

Complex magical images

You can freeze any character/colour combination you particularly like by hitting the Stop key, then Run and Return to continue. If you are fortunate enough to possess a VCR, you can also videotape the effects this program fleetingly displays and view them again later, as many times as you like.

■ Like to hear some alien vibes? Lay this on your Vic:

```
10 POKE 36878,15
20 FOR X=1 to 18:POKE 36874,252-X
30 NEXT:POKE 36874,0:GOTO 10
```

Or, to back up that brilliant Chopper program you are just about to write:

```
10 POKE 36878,15:FOR X=255 TO 128 STEP
-12
20 POKE 36877,X:NEXT:GOTO 10
```

TO save you the chore of updating the colour code location every time you Poke a character into screen memory, set up these variables at the beginning of any program needing them:

```
10 SC=7680:CC=SC+30720
```

The number 30720 is, of course, the difference between the first screen location — 7680 — and the first colour memory map position — 38400.

■ Another wheeze to give those pirates problems; drop this line in early in your program:

```
10 POKE 808,PEEK(808)+2:POKE 37150,
PEEK(37150)AND 127
```

This serves to disable the Run Stop and Restore keys, thus making List and Save impossible to execute. To restore normal operation, enter this line:

```
90 POKE 808,(PEEK)808-2:POKE 37150,PEEK
(37150)OR 127
```

■ The only trouble with Pokes which disable certain keyboard functions in a bid to combat plagiarism is that they can be identified and wiped by simply Listing the program before it is Run. There is a much better way of safeguarding your programming secrets — remembering that just one line of novel or ingenious technique can have a value much greater than its application is just one particular program.

First, List the program you want to protect and select the first line for attention; perhaps one containing some crucial Peeks and Pokes or formulae. The only qualification is that it must contain fewer than 17 characters — including the line number and any spaces. At the end of the existing line, add exactly this:

```
:REM""
```

That is, a colon hard up against the final character of the existing line followed by Rem in capitals and two quote marks. There should be *no* spaces between these six new characters. Now hit Return.

Next, cursor back to the space immediately following the new line ending and hit Del once to remove the second quote marks. Now hold down Shift and press the Inst key precisely 22 times. Release Shift and press the Del key precicely 22 times. Now hit Return.

That's all there is to it. Clear the screen and List the program again. You may see your newly-protected line appear for a fraction of a second and then vanish. The same will occur whenever it is Listed — even if this doctored version of your program is Saved and Loaded again — so do not forget to keep your own copy of the unexpurgated Listing.

You can, of course, repeat this procedure with as many more lines as you wish — provided none of them exceeds 17 characters in length.

■ Wait is a much less long-winded version of Get, with its emply quotes and all the rest, but it works with only a couple of keys. One is the Commodore flat key, as in this example:

```
10 PRINT "TOUCH C= KEY TO CONTINUE"
20 WAIT 653,2:WAIT 653,2,1
30 PRINT "OK — CONTINUING"
```

Substituting 1s for the 2s in line 20 will allow you to use the Shift key instead — so alter line 10, too.

Touching any other key when this routine is called — including Run Stop — has no effect — a built-in mug trap.

■ Some more keyboard tricks worth keeping up your Qwerty. Poke 808,100 not only disables the Run Stop key but also makes your program indecipherable if Listed. Restore with Poke 808,112. Knock out the keyboard completely with Poke 649,0 and make it live again with Poke 649,10. If you want a cursor flashing with Get statements the way it does with Input, Poke 204,0. The usual value is 1.

Poke 211 with any number between 0 and 22 to set the cursor's column position, and 0 and 23 if you want to Poke 214 with a new row location. Only the space bar and cursor controls offer auto repeat the way Vic comes out of the box. But Poke 650,255 will make every key repeat faster than a bowl of radishes; Poke 650,0 disables this facility.

■ Start enjoying some screen acrobatics with the locations which control Vic's display area. Location 36864 usually holds the value of 12. Try this:

```
10 FOR L=12 TO 65
20 POKE 36864,L :NEXT
```

The screen's vertical position is normally

(continued on page 151)

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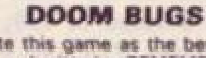
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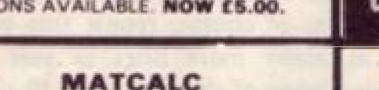
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AND

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PURSUED by the CHASER you have to PUSH the THUMPERS off SCREEN. All BLOCKS are SLIDERS but don't go near the CHASER or you get "YOUR BUMPER THUMPED" GOOD GRAPHICS.

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(continued from page 149)

Poke 36866,150. Tinkering with this value will also produce some interesting effects.

■Introducing a reverse field character or string is an easy matter within Print statement; just a question of holding down the Ctrl and Reverse On keys. But when you are Poking characters into screen memory, simply use Poke 199,1 to get into reverse; Poke 199,0 to get out of it.

■It is often reassuring if responses to Input, Get or Wait statements are acknowledged with a satisfying bleep. It is easy to add this facility — preferably in the form of a subroutine, if it is to be used several times in the course of a single program:

```
10 IF PEEK(197)<>64 THEN POKE 36878,15:
   POKE 36876,232: FOR D=1 TO 10: NEXT
```

Add another colon and Return if used as a sub-routine.

■Using Peek(197) to test keyboard input from any of the four function keys has one big disadvantage; the value returned is the same whether the key is Shifted or not — that is, f1/f2 answers Peek(197) with 39; f3/f4 with 47; f5/f6 with 55; and f7/f8 with 63. The way round this snag, so you can make sure of all eight keys, is a different form of statement using the keys' ASCII values, like this:

```
10 PRINT "(CLR)":GET K$:IF K$=CHR$(133)
THEN 30
20 GOTO 10
30 PRINT "YOU PRESSED KEY f1":END
```

You can test for any number of function keys in the one statement, using the appropriate ASCII value for each. These are: f1, 133; f2, 137; f3, 134; f4, 138; f5, 135; f6, 139; f7, 136; and f8, 140.

■One simple Poke will put some speed onto your programs, let you zoom through screen editing, and allow you to build graphic displays much quicker than usual. Location 37159 normally holds a value of 72.

Slowing down the clock

Anything below this, down to Poke 37159,10, speeds Vic's internal clock and everything governed by it — including the cursor flash rate. Conversely, Poking this location with values up to 255 will slow down all the complementary processes.

■When studying or keying listings reproduced in *Your Computer* and other publications, do not make the mistake of confusing the proper statement CLR with the abbreviation for a screen clear properly shown in square or curly brackets — that is, [CLR] or {CLR} — and which appears on-screen as a heart shape.

The *statement* CLR is something else altogether; it serves to wipe any variables, to restore the Data pointer to the first item in the queue, and to 'unDimension' any arrays; all functions which are automatically performed also whenever Load, Run or New is executed.

■Direct mode statements or functions can be useful during program development — for example, to test the value of a particular location in a program temporarily halted with a Stop.

Better still, you can string several direct mode statements together in one line using a colon to divide them, just like you would with a conventional numbered program line. Here is a simple example:

```
10 POKE 36878,15: POKE 871,0: POKE
3687,1.
```

Hit Return, Run and Return again. Now type — with no line number — ?PEEK 36878:?PEEK 871:?PEEK 3687 and hit Return once more. The new screen display will confirm the values you Poked with line 10. Do not underestimate the value of this facility. You could, for example, use it as a kind of What If . . .? statement in concert with an offbeat line whose effects you wish to test.

■Try experimenting with Vic's screen width and height to produce interesting graphic variations. Poke locations 36866,16 and 36867 with values from 16 and 32 upwards respectively; the proper values are 150 and 174. You will have to execute a screen clear, too.

■As a fundamental step towards faster program execution, use Print statements wherever possible in preference to Pokes, avoid If Then . . . Gotos, and never type the superfluous Let prefix when labelling variables.

■Numbering your lines from 100 and thereafter in increments of 10 may look and seem neat, but it is a practice that gobbles up bytes. A program of 100 lines numbered in that fashion will occupy 301 bytes in line numbers alone. But using simply 1 to 100 instead will take just 189 bytes.

■Another use for that rarely used Wait statement is in programs, and particularly games, using a joystick. Given that it is used to move your craft or whatever around playfield, and to zap away at all those lovely user-defined invaders, it seems rather clumsy reverting to the keyboard to call another game. Instead, add these lines:

```
2000 PRINT "PRESS FIRE BUTTON TO PLAY
AGAIN"
2010 WAIT 37137,32
2020 WAIT 37137,32,32
2030 RUN
```

■If you are working on a household management or similar program, you may like to know about this easy way of persuading Vic-20 to display neatly whole numbers and/or decimals; it otherwise ranges them all to the left, which can be confusing and anyway looks ugly. Here is a simple demo of the technique:

```
10 PRINT " [CLR]"
20 INPUT "NUMBER?";N
30 IF N=>1 THEN PRINT TAB(15-LEN(STR$(
INT(N))))N
40 IF N<1 THEN PRINT TAB(14)N
50 GOTO 20
```

■There is a method of changing by direct statements the colour of your working screen if the standard — and rather insipid — combination of blue on white with a cyan border — Poke 36879,27 — does not suit your taste or your eyesight.

To ring the changes, choose a new combination of screen and border colours; the 127 combinations possible with their relevant values are shown on page 134 of the user's guide. For example, Poke 36879,104 generates a deep blue screen with a black border. Ooops! — lost your cursor?

Just hold down the Ctrl key and press Wht or Yel. Experiment to find the mix that you find most restful and legible. Incidentally, the Rev keys will continue to function, and your new screen/text colour will stay put as you type and enter program lines, List and edit them.

Only pressing Run/Stop and Restore will bring back the original.

■One more way of seeing for yourself the fabulous patterns and effects which Vic's graphic characters can generate so easily. Here's a sample:

```
10 POKE 36879,24:PRINT "[CLR]"
20 FOR L=1 TO 505:X=RND(1)
30 IF X <0.75 THEN PRINT "/";:GOTO 60
40 PRINT "+";
50 NEXT
60 GOTO 60
```

Using any combination of graphic characters within the quotes in lines 30 and 40 — and note that the closing quote marks in each case must be followed by a semi-colon — will produce a limitless range of effects; and the randomiser ensures that a different pattern is generated every time the program is Run, even if you leave the characters the same.

Now add some colour to the Print statements too, as well as Rvs On variations and you could come up with the design for Kraftwerk's next album cover.

■When exploring Vic's music-making capabilities, you will doubtless use Data statements to store both tone values and note durations. But what yardstick should you use when, say, copying from sheet music? A fairly accurate base for music in 4/4 time is, one whole note = 120 jiffies.

Keeping in tempo

Use a larger number to slow the tempo, a smaller one to quicken it. But make sure that the base number you adopt is easily divisible into values for half, quarter and eighth notes at least — and remember to alter these proportionally when you tinker with the whole note value for tempo changes.

■This five-line program will produce an electronic colour swatch which presents every possible combination of screen/border colours and pauses at each; a useful utility when designing games screens:

```
10 PRINT "[CLR]"
20 FOR A=O TO 7:FOR B=O TO 15
30 POKE 36879, 8+16+A*B
40 FOR D=1 TO 800:NEXT D
50 NEXT B: NEXT A
```

■You may be used to constantly checking the screen for a refreshed display incorporating a new prompt, but it is easy to forget that others may not be. And when any screen starts filling up with text and graphics, it always helps to highlight the latest prompt in the same way that the cursor draws attention to itself — with a quick flash, if you will pardon the expression. There are a dozen variations on the following utility; type and Run this version and then improve upon it yourself.

```
10 PRINT "[CLR]"
20 PRINT SPC(200)"FLASHY, AREN'T I?"
30 FOR D=1 TO 800
40 PRINT "[CLR]"
50 FOR D=1 TO 400
60 GOTO 20
```

These are just a few of the ways in wich you can harness Vic's sometimes idiosyncratic but always fascinating logic to bring extra value, visual appeal and entertainment to your programs; I hope they will stimulate you to devise some original programs. ■

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At first glance this might seem to be just another version of a very popular game. How wrong can you be!!! True, the start is simple enough. The Spectrum picks a code of numbers or colours with a selection of levels of difficulty — and invites you to do the same. You then take it in turns to guess each others code from the clue supplied after each guess. An extremely well written, fast and very clearly displayed game, with almost inevitable defeat.

This was exactly as intended but unfortunately *something went wrong*. During the programming strange uncomplimentary messages began to appear on the screen. At first they were so few they were not taken too seriously, but soon they could no longer be ignored. Somehow the Spectrum had been given a personality — a rather devious, supercilious, dislikeable, hateful, horrible mind.



Side B contains a version of the game compatible with the excellent Currah µSpeech unit — even worse!!

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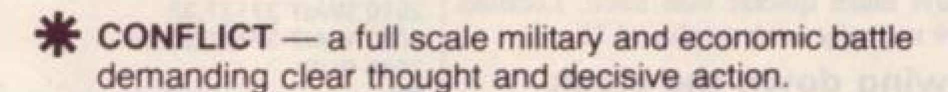
The adventurer becomes Merravid, charged with the task of finding, taking and then returning the magic Firestone of the Dwarves. However, overcoming the many novel and original hazards is no easy matter. Careful and imaginative thought is required if progress is to be made and the Firestone tracked down to the lair of the Dragon of Thargon. Even then the Dragon has to be defeated and the stone retrieved. A compulsive, extremely enjoyable and very user friendly adventure.





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Mike Shackleton converts mnemonics with his 6502 disassembler for the Oric.

DISASSEMBLER

THIS PROGRAM of a 6502 machine-code disassembler for the 48K Oric takes 2K of user program memory so a Basic or machine-code program can still be lôaded. It can disassemble machine-code programs or ROM and is written in machine code for speed. It will disassemble considerably faster than many of its commercial counterparts. Type in program 1 — you can load it with CLOAD "Program", S then Run and New followed by:

OHIMEM # 8FFF : INK7: PAPER0:CLOAD""
CSAVE"DISASMBLR1",A # 400,E # 518...

Press play and record and New. Type in program 2 — you can load it with CLOAD"Program 2",S then Run and New.

Type in program 3 — you can load it with CLOAD"Program 3",S then Run and New followed by:

CSAVE"DISASMBLR2",A # 9000,E # 97FF

The computer must not be turned off in between the last two stages as the code from both is Saved with the final command. To use the program rewind tape and type: New and:

CLOAD "DISASMBLR1"

and press play. The computer loads first stage. Then Run and press Play. The computer loads second stage. Then

CALL # 9144

and stop tape. Contents of the cassette are

(continued on page 157)

Program 1.

```
5 REM<<<<' M.SHACKLETON.1983>>>>
6 REM<<<<PROGRAM1>>>>
10 A=#400
20 READA$
50 IFLEFT$(A$,2)="**"THENPRINTRIGHT$(A$,LEN(A$)-2):GOT
O20
55 IFA$="END"THENEND
60 C=VAL("#"+A$)
70 POKEA,C
80 A=A+1
90 GOTO20
500 DATA**SUB1,AA,29,0F,85,02,8A,4A,4A,4A,4A,C9,0A,90,
0A,E9,0A,18,6
9,41,C8
510 DATA91,08,D0,05,69,30,C8,91,08,A5,02,C9,0A,90,0A,E
9,0A,18,69,41
,C8,91,08
520 DATAD0,05,69,30,C8,91,08,60
530 DATA**SUB2,A9,24,91,08,E6,04,D0,02,E6,05,A2,00,A1,
04,C6,06,F0,1
0,85,07
540 DATAE6,04,D0,02,E6,05,A1,04,20,00,04,EA,A5,07,20,0
0,04,60
550 DATA**SUB3,20,33,04,A9,2C,C8,91,08,A9,58,C8,91,08,
60
560 DATA**SUB4,20,33,04,A9,2C,C8,91,08,A9,59,C8,91,08,
60
570 DATA**SUB5,A9,28,91,08,C8,20,33,04,A9,2C,C8,91,08,
A9,58,C8,91,0
8,A9,29
580 DATAC8,91,08,60
590 DATA**SUB6,20,9B,04,A9,2C,C8,91,08,A9,59,C8,91,08,
60
600 DATA**SUB7,A9,28,91,08,C8,20,33,04,A9,29,C8,91,08,
60
610 DATA**SUBCONVERT,C9,41,B0,06,38,E9,30,38,B0,06,38,
E9,41,18,69,0
A,0A,0A
620 DATA0A,0A,60
630 DATA**SUB8,A9,24,91,08,E6,04,D0,02,E6,05,A2,00,A1,
04,18,69,01,C
9,80
640 DATAB0,13,65,04,85,07,A5,05,69,00,20,00,04,A5,07,2
0,00,04,18,90
,19
650 DATA49,FF,69,00,85,07,A5,04,38,E5,07,85,07,A5,05,E
9,00,20,00,04
,A5,07
660 DATA20,00,04,60,"END"
```

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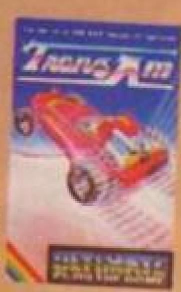
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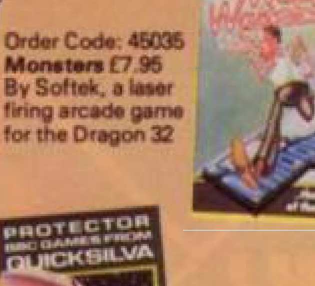
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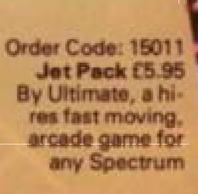
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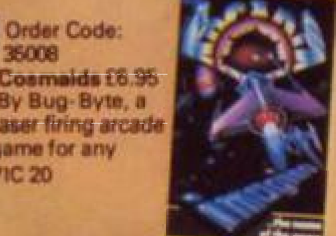
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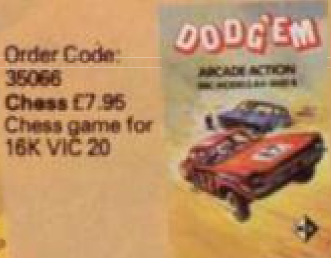
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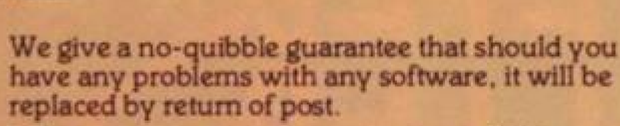
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(continued from page 153)

shown on the cassette — use the slow side as this is more reliable. To make a slow copy use pencil corrections.

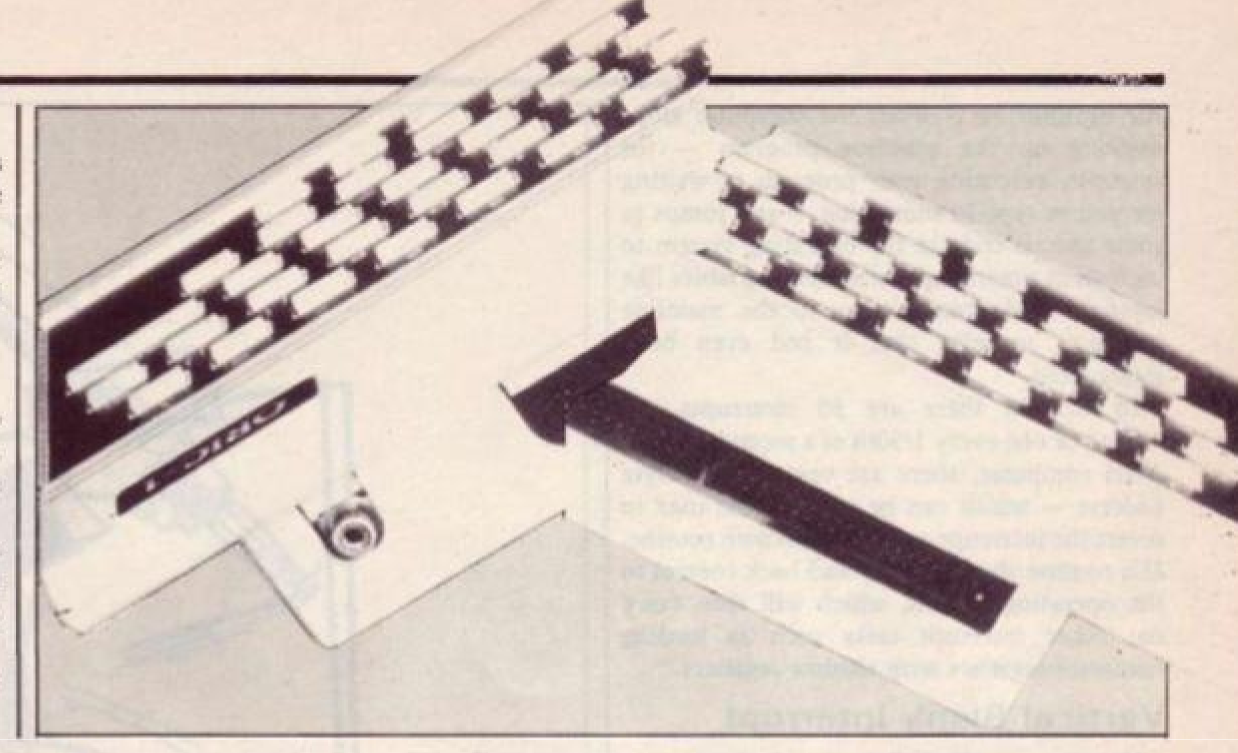
After call #9144 a prompt appears at the bottom left of the screen as >. Then type in the hexadecimal address for disassembly:

```
>0400
0400 TAX
```

The first line appears automatically. To advance line by line press space-bar for each line. For rapid disassembly hold down space bar.

If you wish to disassemble another address press D, a prompt will appear as above and the same procedure is followed. If you try to disassemble 0300-0400 — inclusive — strange results will be obtained as this is the location of the physical I/O address.

To exit from the program type X.



Program 2.

```
5 REM<<<<' M.SHACKLETON.1983>>>>
6 REM<<<<PROGRAM2>>>>
10 A=#9000
20 READA$
30 IFA$="END"THENEND
52 C=VAL("#"+A$)
54 POKEA,C
60 A=A+1
70 GOTO20
500 DATAA2,D1,86,00,A2,B9,86,01,A2,1A,A0,26,B1,00,48,B
8,D0,FA
510 DATAA5,00,38,E9,28,85,00,A5,01,E9,00,85,01,C8,68,9
1,00,C0,26,D0
,F8,A5,00
520 DATA18,69,50,85,00,A5,01,69,00,85,01,CA,D0,D3,A5,0
0,38,E9,28,85
,00,A5,01
530 DATAE9,00,85,01,A9,20,C8,C8,91,00,C0,26,D0,F9,60
540 DATAA2,BB,86,08,A2,BF,86,09,20,00,90,A0,00,A9,3E,9
1,08,A2,04
550 DATABA,48,98,48,20,F8,C5,85,02,~8,A8,68,AA,A5,02,C
8,91,08,20,A9
,04,85,02
560 DATA98,48,A5,02,A0,04,0A,26,04,26,05,88,D0,F8,68,A
8,CA,D0,D6
570 DATAA2,93,86,08,A2,00,A1,04,A0,04,18,61,04,90,02,E
6,08,88,D0,F6
580 DATA85,0A,20,00,90,A0,00,A5,05,20,00,04,A5,04,20,0
0,04,A2,C1,86
,08,A0,00
590 DATAB1,0A,91,08,C8,C0,03,D0,F7,B1,0A,85,06,C6,06,C
8,B1,0A,F0,59
,AA,CA
600 DATAF0,15,CA,F0,2B,CA,F0,2E,CA,F0,31,CA,F0,34,CA,F
0,37,CA,F0,3A
,CA,F0,3D
610 DATAA9,23,91,08,A9,24,C8,91,08,E6,04,D0,02,E6,05,A
2,00,A1,04,20
,00,04,18
620 DATA90,27,20,33,04,18,90,21,20,59,04,18,90,18,20,6
7,04,18,90,15
,20,75,04
630 DATA18,90,0F,20,8D,04,18,90,09,20,9B,04,18,90,03,2
0,BE,04,20,F8
,C5
640 DATAC9,20,F0,0C,C9,44,F0,05,C9,58,D0,F1,60,4C,4F,9
0,E6,04,D0,02
,E6,05
650 DATAA2,BB,86,08,4C,8C,90,A2,B0,86,00,A2,BB,86,01,A
2,62,86,04,A2
,91,86
660 DATA05,A0,00,B1,04,91,00,C8,C0,13,D0,F7,4C,4F,90,6
0,20,4D,2E,53
,48,41,43
670 DATA4B,4C,45,54,4F,4E,2E,31,39,38,33,"END"
```

Program 3.

```
5 REM<<<<' M.SHACKLETON.1983>>>>
6 REM<<<<PROGRAM3>>>>
8 P=#9300
10 FORA=0TO255
20 READA$
30 FORB=1TO3:POKEP+A*5+B-1,ASC(MID$(A$,B,1))-ASC("A")+
65:NEXT
40 FORB=4TO5:POKEP+A*5+B-1,VAL(MID$(A$,B,1)):NEXT
50 NEXT
500 DATABRK10,ORA25,???10,???10,???10,ORA22,ASL22,???1
0,PHP10,ORA21
,ASL10
510 DATA???10,???10,ORA32,ASL32,???10,BPL28,ORA26,???1
0,???10,???10
,ORA23
520 DATAASL23,???10,CLC10,ORA34,???10,???10,???10,ORA3
3,ASL33,???10
,JSR32
530 DATAAND25,???10,???10,BIT22,AND22,ROL22,???10,PLP1
0,AND21,ROL10
,???10
540 DATABIT32,AND32,ROL32,???10,BMI28,AND26,???10,???1
0,???10
550 DATAAND23,ROL23,???10,SEC10,AND34,???10,???10,???1
0,AND33,ROL33
,???10,RTI10
560 DATAEOR25,???10,???10,???10,EOR22,LSR22,???10,PHA1
0,EOR21,LSR10
,???10
570 DATAJMP32,EOR32,LSR32,???10,BVC28,EOR26,???10,???1
0,???10,EOR23
,LSR23
580 DATA???10,CLI10,EOR34,???10,???10,???10,EOR33,LSR3
3,???10,RTS10
,ADC25
590 DATA???10,???10,???10,ADC22,ROR22,???10,PLA10,ADC2
1,ROR10,???10
,JMP37
600 DATAADC32,ROR32,???10,BVS28,ADC26,???10,???10,???1
0.ADC23.ROR23
,???10
610 DATASEI10,ADC34,???10,???10,???10,ADC33,ROR33,???1
0,???10,STA25
,???10
620 DATA???10,STY22,STA22,STX22,???10,DEY10,???10,TXA1
0,???10,STY32
,STA32
630 DATASTX32,???10,BCC28,STA26,???10,???10,STY23,STA2
3,STX24,???10
,TYA10
640 DATASTA34,TXS10,???10,???10,STA33,???10,???10,LDY2
1,LDA25,LDX21
,???10
650 DATALDY22,LDA22,LDX22,???10,TAY10,LDA21,TAX10,???1
0,LDY32,LDA32
,LDX32
660 DATA???10,BCS28,LDA26,???10,???10,LDY23,LDA23,LDX2
4,???10,CLV10
,LDA34
670 DATATSX10,???~0,LDY33,LDA33,LDX34,???10,CPY21,CMP2
5,???10,???10
,CPY22
680 DATACMP22,DEC22,???10,INY10,CMP21,DEX10,???10,CPY3
2,CMP32,DEC32
,???10
690 DATABNE28,CMP26,???10,???10,???10,CMP23,DEC23,???1
0,CLD10,CMP34
,???10
700 DATA???10,???10,CMP33,DEC33,???10,CPX21,SBC25,???1
0,CPX22,???10
,SBC22
710 DATAINC22,???10,???10,SBC21,NOP10,INX10,CPX32,SBC3
2,INC32,???10
,BEQ28
720 DATASBC26,???10,???10,???10,SBC23,INC23,???10,SED1
0,SBC34,???10
,???10
730 DATA???10,SBC33. INC33,???10
```

■

AN INTERRUPT IS when the computer stops working on the mainline program — for example, executing your program or waiting for you to type in something — and jumps to some special code in the operating system to increment timers, update system variables like joysticks and then returns to the mainline program, unaware that it had even been interrupted.

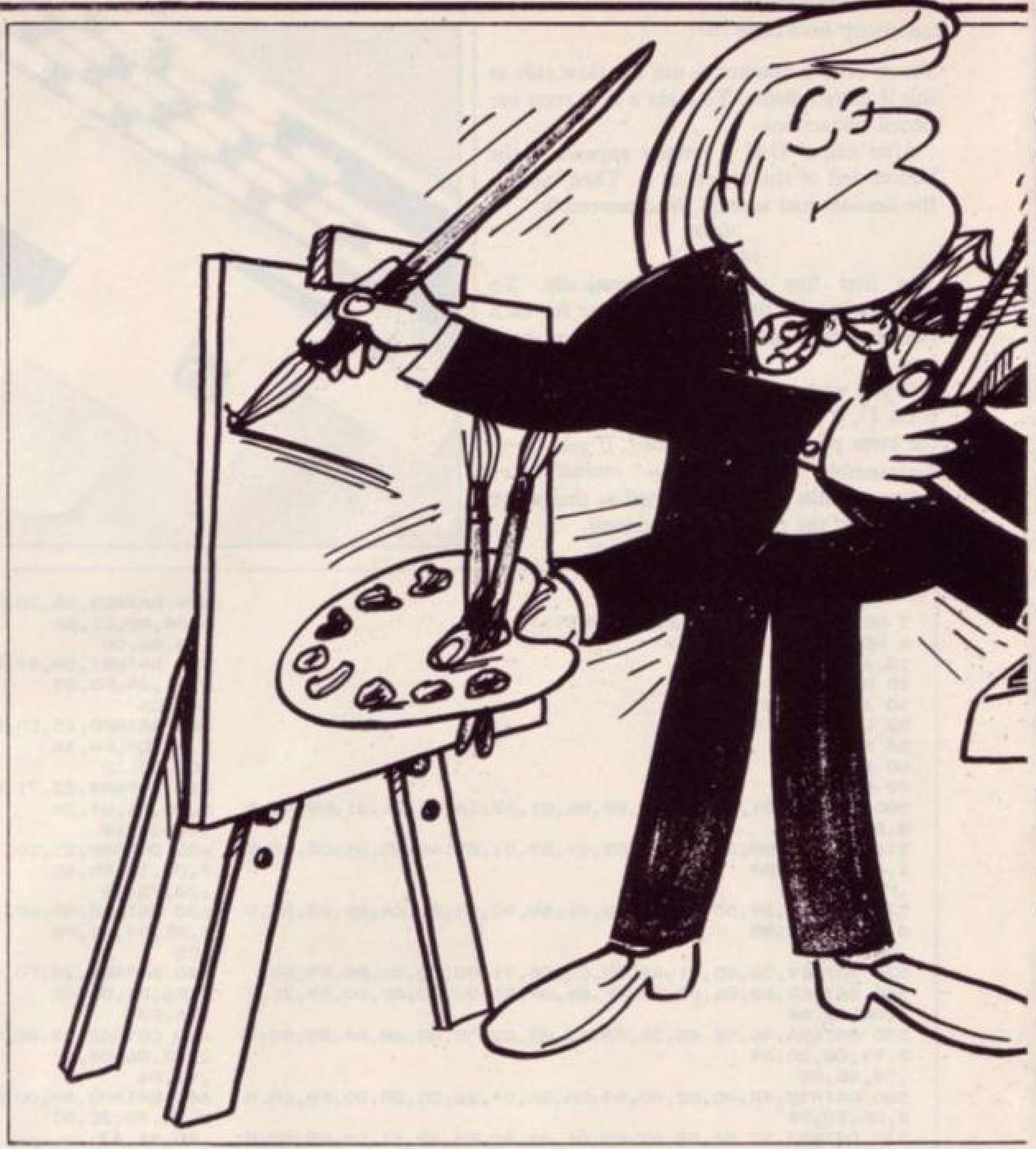
In Britain, there are 50 interrupts per second or one every 1/50th of a second. On the Atari computer, there are vectors — 2 byte address — which can be used by the user to divert the interrupt routine to his own routine. His routine should then hand back control to the operating system, which will then carry out other interrupt tasks such as loading hardware registers with shadow registers.

Vertical Blank Interrupt

The Vertical Blank Interrupt — VBI — is so called because this interrupt occurs just after the computer has drawn the screen. The screen then goes blank ready for it to be drawn once again. To create an interrupt you first have to have your machine-code routine somewhere in memory, for instance Page six — 1536 to 1791. Your code can consist of anything but should not be too long as the computer might start getting impatient by shaking up the screen display. Do not end it by putting a RTS but instead a JMP $E462.

You have to enable it

Now you have to enable it. Unfortunately, you cannot just Poke the address of your routine into its appropriate vector — $224,5 — since there is the risk of an interrupt vectoring through that vector after you have changed one byte but before you have changed the second. The result will probably send the 6502 into a totally confused piece of memory.



INTERRUPTS ATARI

```
0 REM ATARI INTERRUPTS:PROGRAM 1
1 REM BY CHRIS LAM
5 SOUND 0,0,0,0
10 DATA 160,4,162,6,169,7,32,92,228,104,
96
20 DIM ACT$(11)
30 FOR N=1 TO 11:READ A:ACT$(N,N)=CHR$(A
):NEXT N
1500 FOR N=1 TO 48:READ A:POKE 1539+N,A:
NEXT N
1510 ACT=ADR(ACT$)
1520 XX=USR(ACT)
10000 DATA 174,28,2,240,3,76,98,228,162,
50,142,28,2,166,203,240,15,162,0,134,203
,162,6,142,243,2,142,197,2,76
10010 DATA 98,228,162,1,134,203,162,2,14
2,243,2,142,197,2,76,98,228,0
```

Luckily for us, there is a special routine to Poke two bytes into a vector without the risk of an interrupt; it is called SetVBI and is situated at $E45C. Register A should hold a seven, X should hold the high byte and Y the low byte. Y*256+Y should point to your routine; the 7 in register A tells the operating system where to put X and Y.

Type in program 1 and study the two sections of code needed to get it going. The second program is rather more elaborate. After entering it, turn up your TV speaker and Run it. Past ZX Spectrum owners will no doubt recognise it. Just one more point on VBI's. There are, in fact, two types of VBI — deferred and immediate.

Deferred addresses

The addresses I have mentioned up until now refer to the deferred type. The main difference is that the immediate one is executed before the operating system updates anything and the deferred afterwards. You usually use a deferred if it affects the screen, e.g., colour changes but there is no reason why you can't have both working at the same time.



Chris Law takes you through Vertical Blank Interrupts — what they are and how to use them on the Atari.

```
0 REM ATARI INTERRUPTS:PROGRAM3
1 REM BY CHRIS LAM
10 FOR N=0 TO 15:READ A:POKE 1536+N,A:NE
XT N
20 ST=PEEK(560)+PEEK(561)*256
30 POKE ST+3+3+11,130
40 POKE 512,0:POKE 513,6
50 POKE 54286,192
1000 DATA 72,141,10,212,169,0,141,24,208
,169,6,141,1,212,104,64
```

The instructions for immediate VBI are:

- Terminate routine with a SMP$ E45F
- Its vector is $ 222,3
- Make register A hold six.

The Display List Interrupt or DLI is very special. Whereas all computers have something similar to Atari's VBI, the DLI is unique. Again, as with fine scrolling and display lists, all credit goes to Antic. In the Display Lists article in *Your Computer,* you will have seen that the most significant bit of a byte enables DLI. Well, what exactly is a DLI?

The DLI enable

DLI is an interrupt executed while the screen is being drawn. Therefore, when Antic comes across a DLI enable, it will freeze the 6502 and send it, through a vector — $200,1 — to your routine. Actually, how far down the screen it is executed depends on how far down the display list the DLI enable(s) are.

If you have a DLI enable with Antic Mode 2 — Graphics 0 — right after the IMS operaids, then the interrupt is called while the second GR.0 line is being drawn. As a result the changes made by the interrupt will not be seen until the third line is being drawn.

The structure of your routine should be kept to four stages:

- The saving of all registers, whose values will be altered during the DLI.
- Wait for Antic to finish drawing the current line.
- Change appropriate locations.
- Restore all registers and leave the interrupt.

Type in program 3 and study the appropriate code listing. In this program, we have inserted the DLI enable half down the display list and consequently it was executed half way down the screen. This time we are free to poke in the address of our routine as long as we enable the interrupt — Poke $4286,192 — afterwards.

No unsightly border

STA WSYNC ($4282) will freeze the 6502 until the current line is completely printed. This is so that we do not have unsightly border where the changes take place.

Although we have only one DLI vector to use, it is not difficult to achieve many. To do this, make your first DLI Poke the address of the second DLI into $200,1. Then the next time it meets a DLI enable, it will vector through to your second routine and so on. Make sure that the last DLI pokes back the address of the first DLI into $200,1.

DLIs must be kept very short and should only affect registers related to the screen e.g., colour changes. Anything else can be done with an ordinary VBI.

The next example — program 4 — demonstrates Atari's trump card, the ability to put dozens of colours on to the screen at once; two dozen in this case. All the Antic modes in the display list have been enable. Have a go at converting it to display 192 colours in GR.8 — normally only two colours.

Program 5 will show you have to combine GR.9-11 with the other modes. The secret is that with GR.0-8, location 623 (GPRIOR) holds 0 but GR.9-11 will hold 60, 128 and 192 respectively. In figure 1 you will see the set-up on the screen.

Write to hardware register

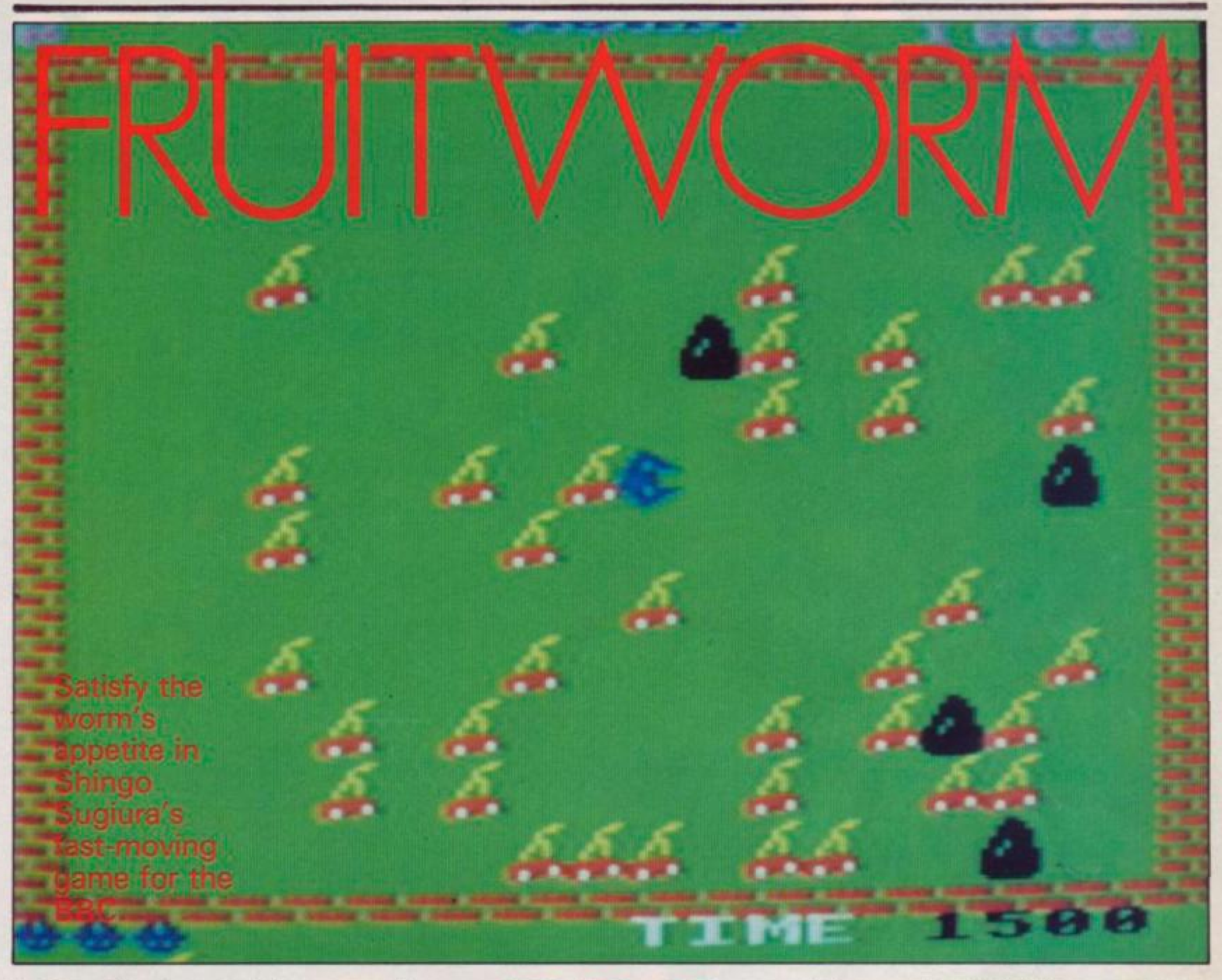
You should always write to the hardware register. Each hardware register has a shadow register from where data is moved from to its hardware register every 50th of a second. Therefore if we write to the shadow register it is permanent since that value will always be located to its hardware equivalent. We have to write to hardware registers instead and the OS interrupt will reset them.

For even deeper information, obtain a copy of *De Re Atari* (£17) and/or a copy of the *Atari Reference Notes* (£17) and perhaps even an assembler/editor cartridge (£40) which is essential to understand Atari's hidden powers. Note that $ denotes hexadecimal numbers.

```
0 REM ATARI INTERRUPTS:PROGRAM4
1 REM BY CHRIS LAM
10 FOR N=0 TO 28:READ A:POKE 1536+N,A:NE
XT N
20 ST=PEEK(560)+256*PEEK(561)
30 POKE ST+3,128+64+2
40 FOR N=0 TO 22:POKE ST+6+N,130:NEXT N
50 POKE 512,0:POKE 513,6
60 POKE 54286,192
70 POKE 712,10
1000 DATA 72,141,10,212,165,203,201,230,
240,10,24,105,10,133,203,141,24,208,104,
64,169,0,133,203,141,24,208,104,64
```

```
0 REM ATARI INTERRUPTS:PROGRAM5
1 REM BY CHRIS LAM
5 GRAPHICS 9
10 FOR N=0 TO 10:READ A:POKE 1536+N,A:NE
XT N
15 POKE 623,0
20 ST=PEEK(560)+256*PEEK(561)
31 POKE ST+3,66:POKE ST+6,2
32 POKE ST+7,6:POKE ST+8,134
33 POKE ST+168,65:POKE 169,PEEK(560):POK
E 170,PEEK(561)
50 POKE 512,0:POKE 513,6
60 POKE 54286,192
70 POKE 710,0
100 POKE 87,0
110 POSITION 0,0:? "   ATARI INTERRUPTS-
FROM Your Computer "
120 ? "YOU MUST BE PROUD OF YOUR ATARI N
OW!?!"
125 POKE 87,1:POSITION 0,4
130 ? #6;" WE ARE NOW IN GR.1"
140 ? #6;" GR.1 ONCE AGAIN !!"
150 POKE 87,9:C=0
160 FOR N=3 TO 176 STEP 10
170 COLOR C:C=C+1:IF C=16 THEN C=1
180 FOR I=0 TO 10:PLOT 0,N+I:DRAWTO 79,N
+I:NEXT I:NEXT N
500 GOTO 500
1000 DATA 72,141,10,212,169,64,141,27,20
8,104,64
```

```
0 REM ATARI INTERRUPTS:PROGRAM 2
1 REM BY CHRIS LAM
2 REM TURN UP TV SPEAKER.
5 SOUND 0,0,0,0
10 DATA 160,4,162,6,169,7,32,92,228,104,96
20 DIM ACT$(11)
30 FOR N=1 TO 11:READ A:ACT$(N,N)=CHR$(A
):NEXT N
1500 FOR N=1 TO 120:READ A:POKE 1539+N,A
:NEXT N
1510 ACT=ADR(ACT$)
1520 XX=USR(ACT)
10000 DATA 169,175,141,1,210,165,203,141
,0,210,174,28,2,224,0,208,21,164,204,185
,52,6,141,28,2,200,185,52,6,133
10010 DATA 203,192,71,240,6,200,132,204,
76,98,228,160,0,132,204,76,42,6,50,121,5
0,108,25,102,25,108,50,121,50,121
10020 DATA 50,108,25,102,25,108,50,121,5
0,102,50,91,100,81,50,102,50,91,100,81,3
8,81,12,76,25,81,25,91,25,102
10030 DATA 25,108,50,121,38,81,12,76,25,
81,25,91,25,102,25,108,50,121,50,121,50,
162,100,121,50,121,50,162,100,121
```



FRUITWORM

Satisfy the worm's appetite in Shingo Sugiura's fast-moving game for the BBC.

BBC

In Fruit Worm your task is to move a hungry worm around the garden which is full of fruits. You have to guide him so that he can eat the fruits and grow to be an adult worm, but the trouble is there are rocks and the brick wall to be avoided and the task of keeping your wary eyes on the time which is constantly ticking away.

Save sections of memory

First type in listing 1 and Save it under the name of 'INIT', then type in listing 2 and Save it under the name of 'BFRUIT' on a different cassette. Run listing 2 and the cursor should reappear in a few seconds. You must now Save the sections of memory which contains the data for the multi-coloured characters i.e., the fruits. To do this type

*SAVE "FRUIT" 2D00+550

wind the tape containing 'INIT' to just after 'INIT' and press Return. After this type in listing 3 and Save it after 'INIT' and 'FRUIT' before you run it.

All this must be done because the program contains quite a bit of machine code and thus could crash the machine if there is a mistake, probably resulting in Bad Program. Those fortunate enough to have disc drives won't have to go through all this but must make sure not to insert any extra spaces in the third program otherwise they will probably get a No Room message.

Now rewind the tape to the beginning and Chain the program. When 'INIT' is loaded the title page will appear. Press Stop on tape unless you have motor contol facility or have discs — in which case the first program will load the main program at &1100. When the title page appears you can press Q if you do not want any sound otherwise press the space-bar to load the rest of the program.

The game will begin

When 'FRUIT' and 'WORM' are loaded, the game will begin. In the middle of the screen you will see the worm's head for a while before it starts moving — in the first screen there is a short burst of music so if you have the sound off nothing will be happening for a while. This can look as if the machine has crashed so resist the temptation to press Escape. In fact, this precaution applies to various other points in the game where there is music.

You control the movement of the snake with Z, X, : and / to move left, right, up and down respectively. If you manage to make the worm gobble up enough fruits before the time runs out, the remaining time will be added to the

(continued on page 165)

Listing 1.

```
10REM Fruit Worm  V1
20REM By Shingo Sugiura
30REM Copyright (C) 1983
40
50PROCdefine
60MODE7:PROCinst
70*L.FRUIT
80*KEYOPAGE=&1100|MCH."WORM"|M
90*FX138,0,128
100END
110DEFPROCinst
120VDU134,157,129,141,31,13,VPOS:PRINT"FRUIT WORM"
130VDU134,157,129,141,31,13,VPOS:PRINT"FRUIT WORM"
140PRINT'TAB(8)CHR$133"By Shingo Sugiura"'
150PRINTTAB(10)CHR$130CHR$141"INSTRUCTIONS"
160PRINTTAB(10)CHR$130CHR$141"INSTRUCTIONS"'
170PRINTTAB(3)CHR$132"'Q' - No sound."
180PRINTTAB(3)CHR$132"'S' - Sound on."
190PRINT'TAB(13)CHR$131"Controls:"''
200PRINTTAB(12)"Z    -    Left."
210PRINTTAB(12)"X    -    Right."
220PRINTTAB(12)":    -    Up."
230PRINTTAB(12)"/    -    Down."
240IF PAGE=&1900 THEN PRINTTAB(2,24)CHR$134CHR$136"P
ress the SPACE BAR to continue.";:PROCwait
250IF PAGE=&E00 THEN PRINTTAB(2,24)CHR$134CHR$136"Pl
ease leave cassette running.";
260VDU28,10,22,30,19
270ENDPROC
280
290DEFPROCwait
300REPEAT
310REPEATA=GET:UNTILA=32ORA=81ORA=83
320IFA=81 THEN *FX210,1
330IF A=83 THEN *FX210,0
340UNTILA=32
350ENDPROC
360
370DEFPROCdefine
380VDU23,224,24,24,60,126,126,255,255,231
390VDU23,225,231,255,255,126,126,60,24,24
400VDU23,226,36,36,102,102,102,231,255,255
410VDU23,227,255,255,219,90,126,60,24,24
420VDU23,228,24,24,60,126,90,219,255,255
430VDU23,229,255,255,231,102,102,102,36,36
440VDU23,230,0,12,28,62,118,247,31,31
450VDU23,231,31,31,247,118,62,28,12,0
460VDU23,232,0,48,56,124,110,239,248,248
470VDU23,233,248,248,239,110,124,56,48,0
480VDU23,234,0,223,223,223,0,251,251,251
490VDU23,235,40,108,108,254,254,84,124,56
500VDU23,236,24,28,60,62,62,126,110,110
510VDU23,237,223,223,255,255,255,255,255,126
520ENVELOPE1,128,2,0,-6,27,47,6,0,0,0,-2,0,0
530ENVELOPE2,1,0,0,0,1,1,1,126,-4,-1,-4,126,0
540ENVELOPE3,1,0,0,0,10,10,10,126,-5,-1,-1,126,50
550ENVELOPE4,1,3,2,-2,6,6,6,100,0,0,-5,100,0
560ENDPROC
```

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- ★ FIND out about all the new peripherals for the BBC Micro – disc drives, interfaces, ROM boards, robots and second processors.
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Schools can obtain additional tickets by sending a stamped addressed envelope to: BBC Micro User Show, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.



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Westminster Exhibition Centre, Greycoat Street, London SW1.

(continued from page 161)

score and you will get to control another worm in another garden with another type of fruit. There are nine kinds of fruit and if you do not kill all four of the worms before this a bonus of 2000 will be added to your score and you will also receive an extra life, then you go on to do the whole thing all over again, but I doubt if many people could even get to the ninth screen very easily let alone do it repeatedly.

When you kill all four worms and the score is in the top eight you will be asked to input your name. This can be anything up to 14 characters long then the top eight scores, together with the names of the scorers will be displayed. At this point if you have the sound off but would like it back on, press S if you have the sound on but want it off press Q, if you like the sound as it is simply press the space bar to replay.

My high-score is 16380 but I am sure many of you will beat that.

The programs are long and typing them in — especially listing ? — will be a long, boring and an arduous process. If you do not have the time or the energy for such a task send a cheque or a postal order for £3.50 made payable to Shingo Sugiura to the following address:

42 Landford Road, Putney, London SW15 1AG.

I will send you a copy of the game on a high quality C15 cassette.

Listing 2.

```
10HIMEM=&2D00
20FORA=0TO575:READB:A?&2D00=B:NEXT
30END
40REM First fruit
50DATA 12,12,12,12,12,12,12,12
60DATA 12,12,12,12,12,13,13,14
70DATA 12,13,14,14,15,13,13,13
80DATA 15,14,12,12,12,12,12,12
90DATA 12,9,3,3,3,3,9,12
100DATA 14,3,3,3,43,43,6,12
110DATA 3,3,3,3,3,9,12,12
120DATA 6,3,3,43,43,6,12,12
130REM Second fruit
140DATA 15,13,12,12,12,29,9,23
150DATA 12,14,15,13,15,23,3,3
160DATA 13,15,14,12,6,3,43,3
170DATA 14,12,12,12,12,46,6,3
180DATA 43,23,3,3,9,9,12,12
190DATA 23,3,43,3,43,3,23,9
200DATA 23,3,23,3,43,3,6,6
210DATA 23,3,3,6,6,12,12,12
220REM Third fruit
230DATA 12,12,12,12,12,12,9,7
240DATA 12,12,13,9,9,9,7,9
250DATA 13,15,15,12,12,9,3,9
260DATA 14,15,15,13,12,6,3,3
270DATA 11,13,14,13,14,3,9,12
280DATA 3,6,11,7,3,9,7,3
290DATA 3,3,11,3,9,3,3,3
300DATA 3,3,3,3,3,6,6,12
310REM Fourth fruit
320DATA 13,12,12,9,23,23,23,23
330DATA 15,13,12,13,3,3,3,3
340DATA 12,14,14,15,11,3,3,3
350DATA 12,12,12,6,3,3,3,3
360DATA 3,3,3,9,9,12,12,12
370DATA 43,43,23,23,3,3,3,9
380DATA 3,3,3,3,3,3,3,6
390DATA 3,3,3,6,6,12,12,12
400REM Fifth fruit
410DATA 13,12,12,12,12,25,28,25
420DATA 15,15,12,25,54,57,54,57
430DATA 14,15,13,51,51,57,54,57
440DATA 15,14,12,12,38,38,38,38
450DATA 54,57,54,57,54,57,54,25
460DATA 54,57,54,57,54,57,38,12
470DATA 54,57,51,57,38,12,12,12
480DATA 38,38,12,12,12,12,12,12
490REM Sixth fruit
500DATA 12,12,12,12,12,12,24,24
510DATA 15,13,12,24,48,48,48,48
520DATA 13,15,6,48,48,48,48,48
530DATA 14,12,12,12,36,36,48,48
550DATA 24,24,12,12,12,12,12,12
560DATA 53,53,53,48,24,24,12,12
570DATA 48,48,48,58,48,48,36,12
580DATA 48,48,36,36,12,12,12,12
590REM Seventh fruit
600DATA 12,12,12,12,12,12,12,12
610DATA 12,12,12,12,12,12,12,12
620DATA 12,12,12,12,12,13,10,10
630DATA 15,15,4,14,14,14,14,14
650DATA 12,12,12,13,15,10,15,14
660DATA 13,15,10,10,5,15,14,12
670DATA 5,5,15,15,14,12,12,12
680DATA 14,14,12,12,12,12,12,12
690REM Eighth fruit
700DATA 12,12,12,12,12,9,13,11
710DATA 12,15,13,9,3,11,7,11
720DATA 15,15,14,14,3,11,3,11
730DATA 12,15,12,12,12,6,6,3
750DATA 7,11,7,11,13,9,12,12
760DATA 7,11,7,11,7,11,7,9
770DATA 7,11,7,11,7,11,3,6
780DATA 3,3,3,3,6,6,12,12
790REM Nineth fruit
800DATA 12,12,12,24,24,24,48,48
810DATA 24,48,48,48,48,48,48,48
820DATA 36,48,48,48,48,48,48,48
830DATA 12,12,12,36,36,36,48,48
850DATA 48,12,3,3,12,15,12,12
860DATA 48,12,3,3,3,15,15,12
870DATA 48,12,3,3,3,6,14,15
880DATA 48,12,3,6,6,12,12,15
```

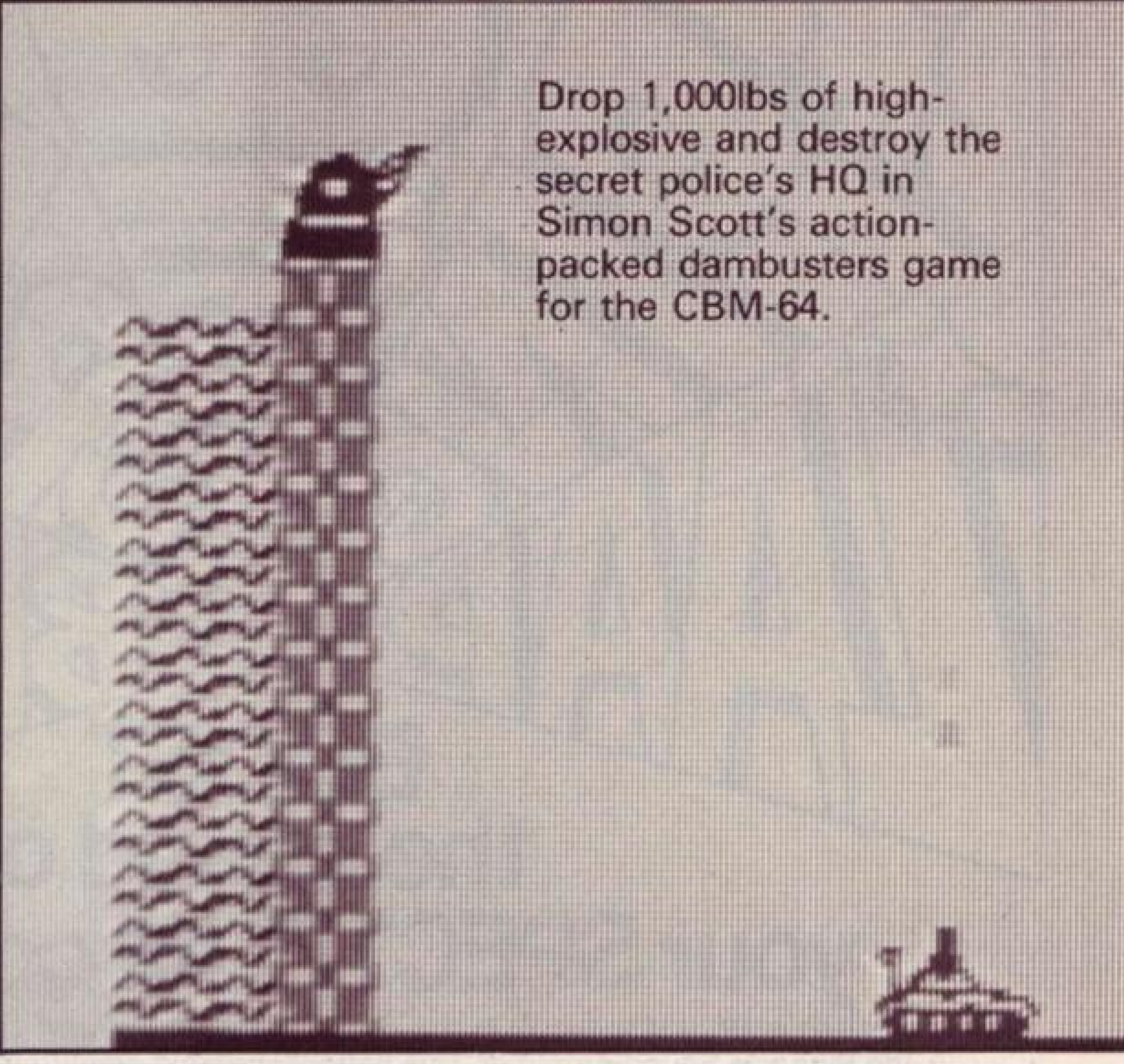
Listing 3.

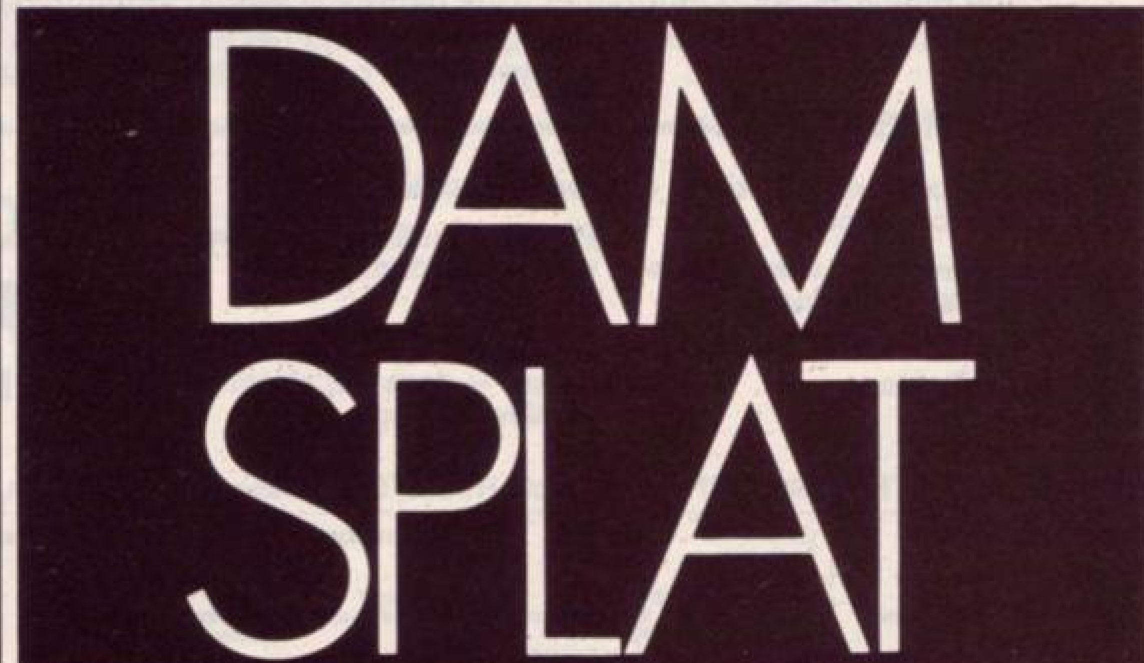
```
10HIMEM=&2D00
20MODE2:PROCass
30REPEAT
40!score=0:screen=1:li=3:done=FALSE
50MODE2:VDU23;10,32;0;0;0;17,130,12
60REPEAT
70PROCscreen:PROCinit:PROCco_ord:PROCmusic:PROCgame
80UNTIL death
90PROCend
100MODE7:PROCtable
110UNTIL FALSE
120DEFPROCgame
130PROCwait(1000):VDU31,10,14,32,10,8,32
140TIME=0
150REPEAT
160PROCwait(100-screen*10):VDU17,5,31,0,1:PRINT;!sco
re
170time=1500-10*(INT(TIME/10)):VDU17,0,31,15,29:PRIN
T;time;" "
180CALL code
190UNTIL ?die=1 OR ?len>=30 OR time<10
200IF ?die=1 OR time<=0 THEN PROCdeath ELSE PROCnew_
screen
210ENDPROC
220DEFFNLOC(X,Y)
230=&3000+X*32+Y*&640
240DEFPROCwait(T)
250FOR delay%=0 TO T:NEXT delay%
260ENDPROC
270DEFPROCco_ord
280FOR A=0 TO 30:A?xco=10:A?yco=14:NEXT
290ENDPROC
300DEFPROCscreen
310VDU5:GCOL0,5:MOVE520,1000:PRINT"WORM"
320GCOL0,4:MOVE512,1004:PRINT"WORM":VDU4
330VDU17,7,31,0,0:PRINT"Score"TAB(15,0)"High";TAB(10
,29);"TIME";
340VDU17,5,31,0,1:PRINT;!score;TAB(15,1);sc(0)
350VDU17,0,31,15,29,49,53,48,48,17,1
360PRINTTAB(0,2)STRING$(20,CHR$(234));
370PRINTTAB(0,28)STRING$(20,CHR$(234));
380FORn=2TO27:VDU31,0,n,234,31,19,n,234:NEXT
390VDU17,4,31,0,29:PRINTSTRING$(li,CHR$235)
400COLOUR0:FOR ob=0 TO screen+5
410VDU31,RND(14)+3,2*(RND(10)+3),236,10,8,237:NEXT
420FORob=0TO40:CH=&2D00+(screen-1)*64:!chr=CH
430LOC=FNLOC((RND(14)+3),2*(RND(10)+3)):!loc=LOC:CAL
L draw
440CH=&2D00+(screen-1)*64+32:!chr=CH:!loc=LOC+&40:CA
LLdraw:NEXT
450VDU17,4,31,10,14,232,10,8,233
460LOC=FNLOC(screen*2,30):CH=&2D00+(screen-1)*64:!ch
r=CH:!loc=LOC:CALL draw
470LOC=FNLOC(screen*2,31):CH=&2D00+(screen-1)*64+32:
!chr=CH:!loc=LOC:CALL draw
480ENDPROC
490DEFPROCinit
500?dir=1:?len=2:?die=0:death=FALSE
510ENDPROC
520DEFPROCdeath
530!score=!score+50:VDU17,5,31,0,1:PRINT;!score;
540FOR A=100 TO 60 STEP-5:SOUND&01,4,A,2:NEXT
550li=li-1:IF li<0 THEN death=TRUE
560PROCwait(3000):IF li>=0 VDU28,0,29,19,0,12,26
570ENDPROC
580DEFPROCmusic:RESTORE
590IFdone ENDPROC
600FORA=1TO18:READB,C:SOUND1,-15,B,C:SOUND2,-12,B-48
,C:NEXT:done=TRUE:ENDPROC
610DATA101,5,121,3,137,5,121,2,129,2,121,2,129,2,121
,4,117,3
620DATA101,5,121,3,137,5,121,2,129,2,121,2,129,2,121
,4,117,3
630DEFPROCtable
640PROCamend:RESTORE
650VDU129,157,31,5,0,130,141:PRINT"Fruit Worm Hall o
f Fame"
660VDU129,157,31,5,1,130,141:PRINT"Fruit Worm Hall o
f Fame"
670VDU31,10,VPOS,134,141:PRINT"Today's Greatest"
680VDU31,10,VPOS,134,141:PRINT"Today's Greatest"
690FOR order=0 TO 7
700VDUorder+49,46:PRINTTAB(6);sc(order);TAB(12)"...
";$(names+order*15)
710NEXT
720PRINTTAB(3,23)CHR$136CHR$134"Press the SPACE BAR
to replay.";
730REPEAT
740REPEATA=GET:UNTILA=32ORA=81ORA=83
750IFA=81 THEN *FX210,1
760IFA=83 THEN *FX210,0
770UNTILA=32
780ENDPROC
790DEFPROCamend:RESTORE940
800IF !score<=sc(7) ENDPROC
810FOR order=7 TO 0STEP-1
820IF !score>sc(order) sc(order+1)=sc(order):$(names
+(order+1)*15)=$(names+order*15):fi=order
830NEXT
840sc(fi)=!score
850PRINTTAB(6,2)CHR$134CHR$141"Congratulations!!"
860PRINTTAB(6,3)CHR$134CHR$141"Congratulations!!"
870PRINTTAB(6,8)CHR$129"Your score of ";!score
880PRINTTAB(0,9)CHR$129"qualifies for the Hall of Fa
me."
890FORA=0TO15:READB,C:SOUND3,7,B,C:SOUND2,3,B-48,C:N
EXT
900PRINTTAB(4,11)CHR$131"Please enter your name."
910VDU31,5,15,134,157,129,31,26,15,156,31,9,15:*FX15
,1
920!&2C00=names+fi*15:?&2C02=14:?&2C03=32:?&2C04=12
7:X%=&00:Y%=&2C
930A%=0:CALLOSWORD:CLS:ENDPROC
940DATA121,2,141,8,141,8,149,8,149,8,169,16,157,2,14
1,6,141,2,157,6,141,2,129,8,161,16,149,6,137,2,141,16
950DEFPROCnew_screen:PROCwait(1000)
960REPEAT:time=time-10:!score=!score+10:SOUND&11,-15
,time/10,1
970VDU17,5,31,0,1:PRINT;!score;:VDU17,0,31,15,29:PRI
NT;time;" ":PROCwait(30)
980UNTIL time<10
990screen=screen+1:IF screen>9 THEN PROCcongrat
1000VDU28,0,29,19,0,12,26
1010ENDPROC
1020DEFPROCcongrat:VDU28,1,27,18,3,12,26:bonus=1000:d
one=FALSE
1030VDU17,1,31,2,10:PRINT"Congratulations"
1040VDU17,0,31,5,15:PRINT"Bonus:1000":PROCwait(3000)
1050REPEAT:bonus=bonus-10:!score=!score+10:SOUND&11,-
15,250-bonus/10,1
1060VDU17,5,31,0,1:PRINT;!score;:VDU17,0,31,11,15:PRI
NT;bonus;" ":PROCwait(30)
1070UNTIL bonus<10
1080PROCwait(2000):VDU17,5,31,5,20:PRINT"Extra life":
SOUND1,2,100,5:li=li+1
1090VDU17,4,31,0,29:PRINTSTRING$(li,CHR$235)
1100PROCwait(5000):screen=1
1110ENDPROC
1120DEFPROCend:RESTORE1150
1130FORA=0TO8:READB,C:SOUND1,-15,B,C:SOUND2,-12,B+48,
C:NEXT:PROCwait(10000)
1140ENDPROC
1150DATA33,20,5,20,5,10,13,10,17,10,13,10,5,10,1,10,5
,30
1160DEFPROCass
1170head=&70:dir=&71:die=&72:len=&73:chr=&74:loc=&76:
score=&7A
1180!&80=&11:!&82=1:!&84=126:!&86=6:!&88=&10:!&8A=-15
:!&8C=7:!&8E=6
1190OSWRCH=&FFEE:OSBYTE=&FFF4:OSWORD=&FFF1
1200DIM sc(8),xco 30,yco 30,names 150,code 400
1210FORPASS=0TO2STEP2:P%=code
1220[OPT PASS
1230JSRkeys:JSRmove
1240LDA#31:JSROSWRCH
1250LDAxco:JSROSWRCH
1260LDAyco:JSROSWRCH
1270JSRfind:TXA:CMP#32:BEQcont
1280TXA:BEQgrow
1290LDA#1:STAdie:JMPcont
1300.grow
1310JSRnoise
1320INClen:CLC:LDAscore:ADC#20:STAscore
1330LDAscore+1:ADC#0:STAscore+1:LDAscore+2:ADC#0:STAs
core+2
1340.cont
1350JSRcal:RTS
1360.move
1370LDA#31:JSROSWRCH
1380LDYlen:LDAxco,Y:JSROSWRCH
1390LDAyco,Y:JSROSWRCH:LDA#32:JSROSWRCH
1400LDA#10:JSROSWRCH:LDA#8:JSROSWRCH:LDA#32:JSROSWRCH
1410LDAdir:CMP#1:BNEnr
1420INCxco:LDA#232:STAhead:RTS
1430.nr
1440LDAdir:CMP#2:BNEnl
1450DECxco:LDA#230:STAhead:RTS
1460.nl
1470LDAdir:CMP#3:BNEnu
1480DECyco:DECyco:LDA#226:STAhead:RTS
1490.nu
1500INCyco:INCyco:LDA#228:STAhead:RTS
1510.cal
1520LDY#30
1530.loop1
1540LDAxco-1,Y:STAxco,Y
1550LDAyco-1,Y
1560STAyco,Y
1570DEY:BNEloop1
1580LDA#17:JSROSWRCH:LDA#4:JSROSWRCH
1590LDY#2
1600.loop2
1610LDA#31:JSROSWRCH
1620LDAxco,Y:JSROSWRCH
1630LDAyco,Y:JSROSWRCH
1640LDA#224:JSROSWRCH:LDA#10:JSROSWRCH:LDA#8:JSROSWRC
H:LDA#225:JSROSWRCH
1650DEY:BNEloop2
1660LDA#31:JSROSWRCH
1670LDAxco,Y:JSROSWRCH:LDAyco,Y:JSROSWRCH
1680LDAhead:JSROSWRCH:LDA#10:JSROSWRCH:LDA#8
1690JSROSWRCH:LDAhead:CLC:ADC#1:JSROSWRCH
1700LDA#19:JSROSBYTE
1710RTS
1720.find
1730LDA#135:JSROSBYTE
1740RTS
1750.noise
1760LDA#7
1770LDX#&80:LDY#&00:JSROSWORD
1780LDA#7:LDX#&88:LDY#&00:JSROSWORD
1790RTS
1800.draw
1810LDY#31
1820.drloop
1830LDA(chr),Y:STA(loc),Y:DEY:BPLdrloop
1840RTS
1850.keys
1860LDX#&B7:LDY#&FF:LDA#&81:JSROSBYTE:TXA:BEQnup
1870LDA#3:STAdir
1880.nup
1890LDX#&97:LDY#&FF:LDA#&81:JSROSBYTE:TXA:BEQndown
1900LDA#4:STAdir
1910.ndown
1920LDX#&BD:LDY#&FF:LDA#&81:JSROSBYTE:TXA:BEQnright
1930LDA#1:STAdir
1940.nright
1950LDX#&9E:LDY#&FF:LDA#&81:JSROSBYTE:TXA:BEQnleft
1960LDA#2:STAdir
1970.nleft
1980RTS
1990]NEXT
2000FOR name=0 TO 7:$(names+name*15)="Shingosoft":sc(
name)=1000-name*100:NEXT
2010ENDPROC
```

Your mission is to destroy the headquarters of the secret state police and the suggested method is to fly over in an aeroplane and bomb the nearby hydroelectric dam. Since you have an unlimited supply of 1000lb bombs on board, this should be a cinch; however, it is not a perfect world, a machine-gun emplacement defends the dam itself and, at the base of the dam, a tank patrols the gorge.

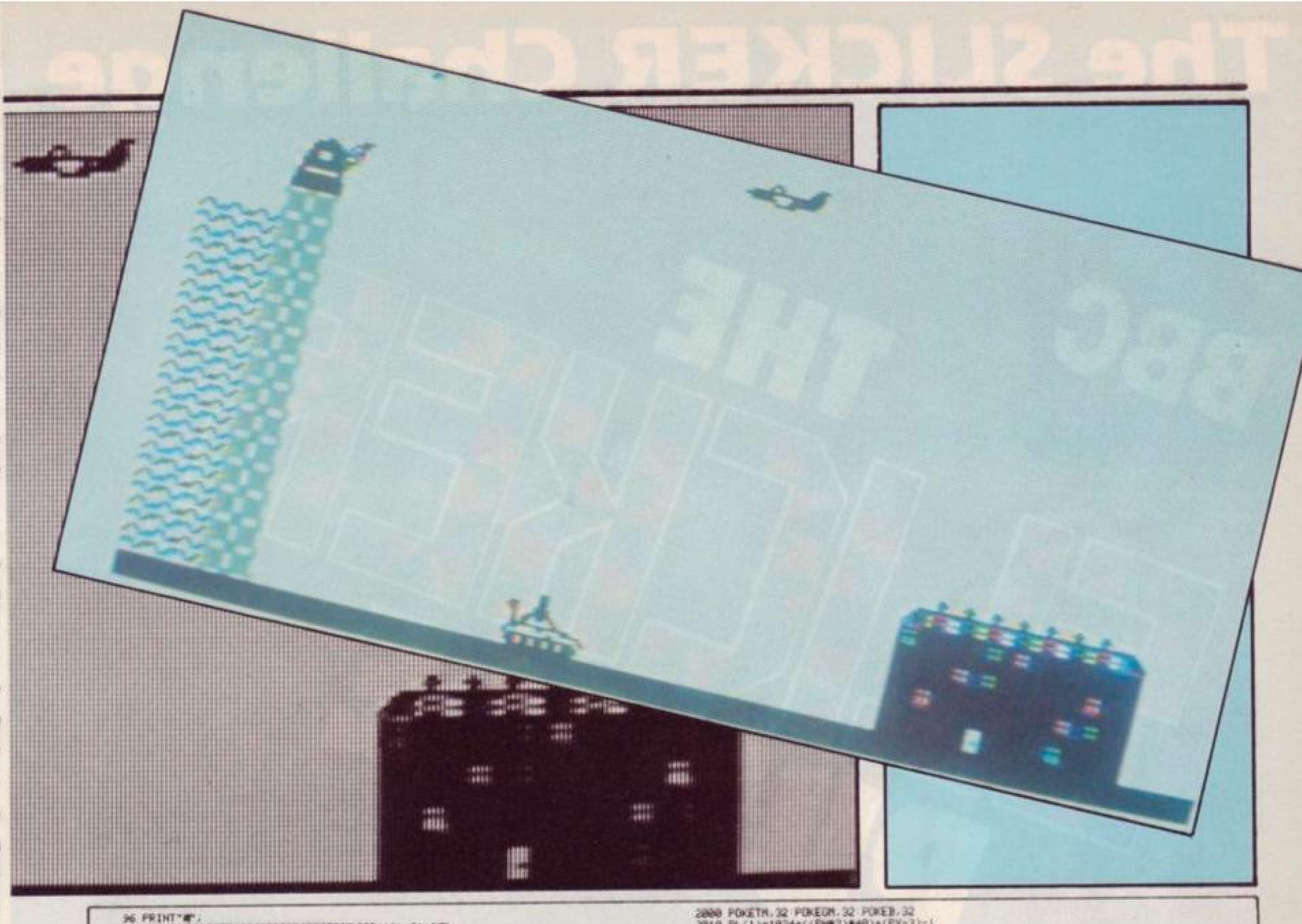
Dam Splat is for the Commodore 64 microcomputer. When Run you see the title page. There is an option of instructions. The game starts with you at the highest altitude towards the right of the screen. As you progress hitting the dam it will slowly erode away and eventually spill its contents. When this is achieved, you are given the option of carrying on at a harder level. This will result in the machine gun and the tank firing more rapidly and, in some cases, the dam becoming thicker. You are continually graded throughout the game and are given a grade from erk — new recruit — to Air Marshal depending on your performance. All controls are given in the game. Note that when typing in line 4034 the graphics symbols represent the message GOOD LUCK ... YOU WILL NEED IT when typed in lower case.

Line	Function
1	set variables: disable Runstop/Restore keys: disable Basic List
2	jump to title page
3	lower memory pointers
4-10	set user defined graphics mode: POKE DATA into memory
20-56	Data for graphics
60-63	set strings
80-99	set up screen ready for game
100-140	main loop
200-220	bomb drop routine
230-245	dam erosion routine
250-260	dam spilling water routine
275-340	mission complete message and rank
400-440	final rank and cold start, resets the computer using SYS 64738
900-920	planes height
930-995	machine-gun fire routine
1000-1010	tank move routine
1100-1150	tank fire routine
2000-2021	plane fall after a hit
2030-2070	explosion and message
3000-3014	title page
3100-3121	instructions option
3130-3150	instruction print-out routine
4000-4045	Data for instructions
4050-4055	wait for a key
5000-5010	set up an array containing ranks





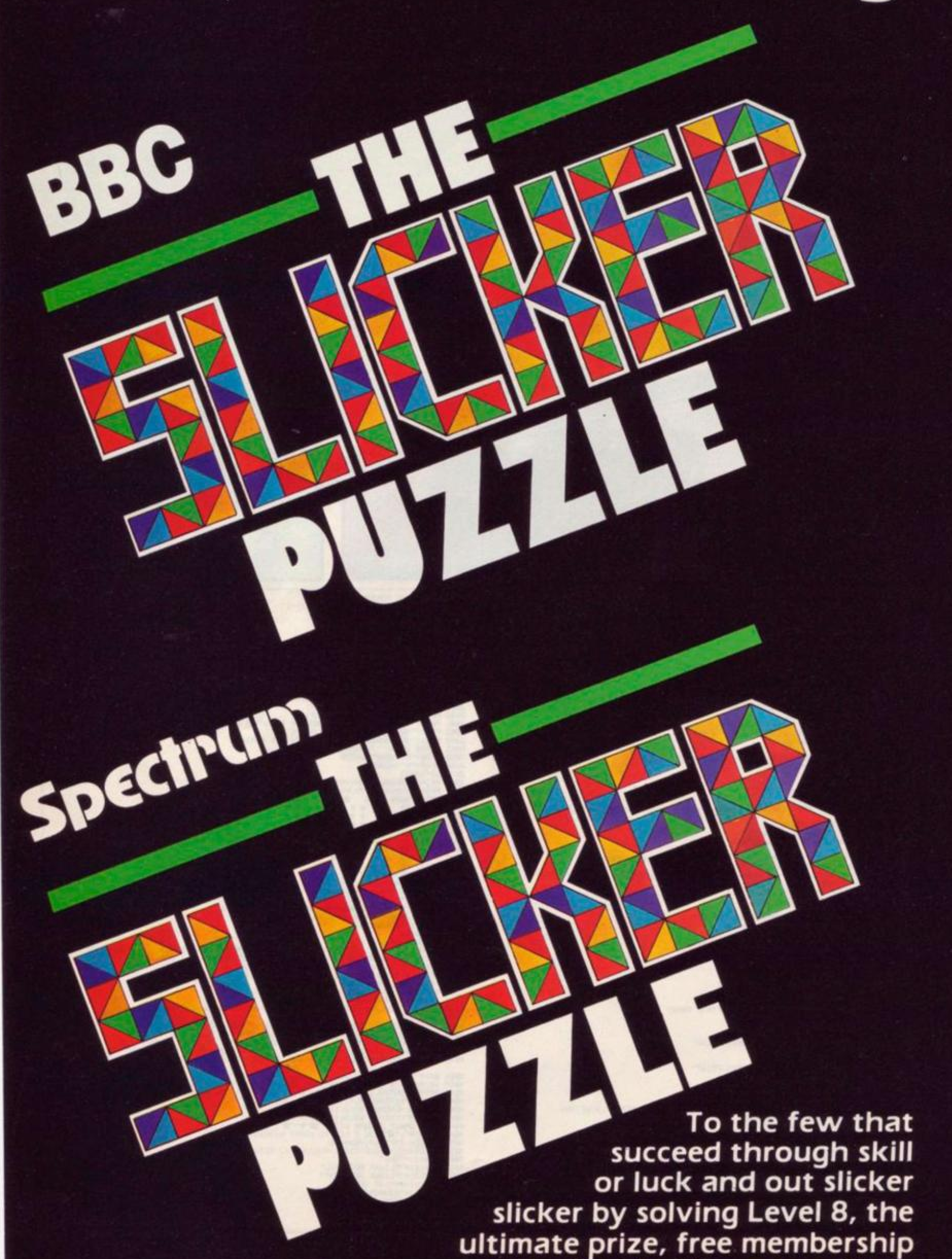

```
0 REM ** WRITTEN BY SIMON SCOTT **
1 PRINT"♥":RA=0:IN=.2:POKE808,225:POKE775,200
2 POKE53280,1:POKE53281,1:GOSUB3000
3 POKE52,48:POKE56,48
4 POKE53272,(PEEK(53272)AND240)+12
5 POKE56334,PEEK(56334)AND254
6 POKE1,PEEK(1)AND251
7 FORI=0TO511:POKEI+12288,PEEK(I+53248):NEXT
8 POKE1,PEEK(1)OR4
9 POKE56334,PEEK(56334)OR1
10 FORI=12288TO12503:READA:POKEI,A:NEXT
20 DATA195,255,126,126,126,126,255,195
21 DATA195,254,124,126,124,120,252,195
22 DATA192,228,104,120,112,112,252,194
23 DATA192,224,112,112,96,112,248,192
24 DATA128,192,64,96,64,64,224,240
25 DATA0,192,0,64,0,64,192,128
26 DATA49,73,134,0,97,146,12,0
27 DATA0,0,128,96,144,24,136,34
28 DATA36,146,73,146,36,34,146,36
29 DATA31,31,48,63,63,127,127,127
30 DATA255,254,2,254,255,255,255,255
31 DATA0,0,3,7,7,14,14,31
32 DATA0,96,240,253,255,30,29,254
33 DATA28,120,144,112,200,32,192,128
34 DATA0,0,0,0,0,1,2,12
35 DATA0,0,32,64,0,0,0,0
36 DATA36,63,80,128,191,115,115,63
37 DATA2,255,32,4,255,51,51,255
38 DATA0,224,124,2,249,52,52,248
39 DATA0,0,0,96,160,96,25,38
40 DATA96,96,96,96,240,240,248,100
41 DATA0,0,32,32,32,80,0,0
42 DATA16,44,182,146,69,54,36,24
43 DATA40,72,182,145,69,141,94,32
44 DATA0,16,40,72,180,44,24,0
45 DATA0,0,0,1,63,255,63,0
46 DATA0,0,192,32,255,3,135,126
47 DATA0,7,14,30,254,124,248,0
48 DATA0,0,0,0,28,120,112,120
49 DATA0,0,0,15,21,42,85,170
50 DATA32,80,32,255,85,120,85,120
51 DATA0,0,0,240,80,172,86,171
52 DATA0,0,0,0,0,0,0,0
53 DATA255,255,235,255,235,255,255,255
54 DATA255,255,195,195,195,203,195,195
55 DATA255,255,215,255,215,215,255,255
56 DATA255,255,255,255,255,255,255,255
57 FORI=1TO3000:NEXT:POKE198,0:GOSUB3100:GOSUB5000
60 T$=" FOR ▀▀▀▀▀ ST ":PRINT"♥"
61 TS$="     ▀▀▀▀▀     "
63 P$="                                  VZI "
80 PRINT"▀▀▀▀▀▀▀▀▀▀▀";
81 PRINT"▀       H"
82 PRINT"      KLM"
83 PRINT"      IJ"
84 PRINT"▀     ▀▀"
85 DA$="▀FF▀▀▀":FORI=1TO13:PRINTDA$:NEXT
86 PRINT"▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀":POKE2023,36:POKE56295,9
87 C=54272
90 PRINT"▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀";:TX=12:TM=1070
91 PRINT"▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀!!!!!!!!"
92 PRINT"▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀!!▀▀▀▀"
93 PRINT"▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀!!▀▀▀▀▀"
94 PRINT"▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀!!▀"
95 PRINT"▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀";CHR$(34);"▀▀▀▀▀":BF=0:GF=0:TF=0
```

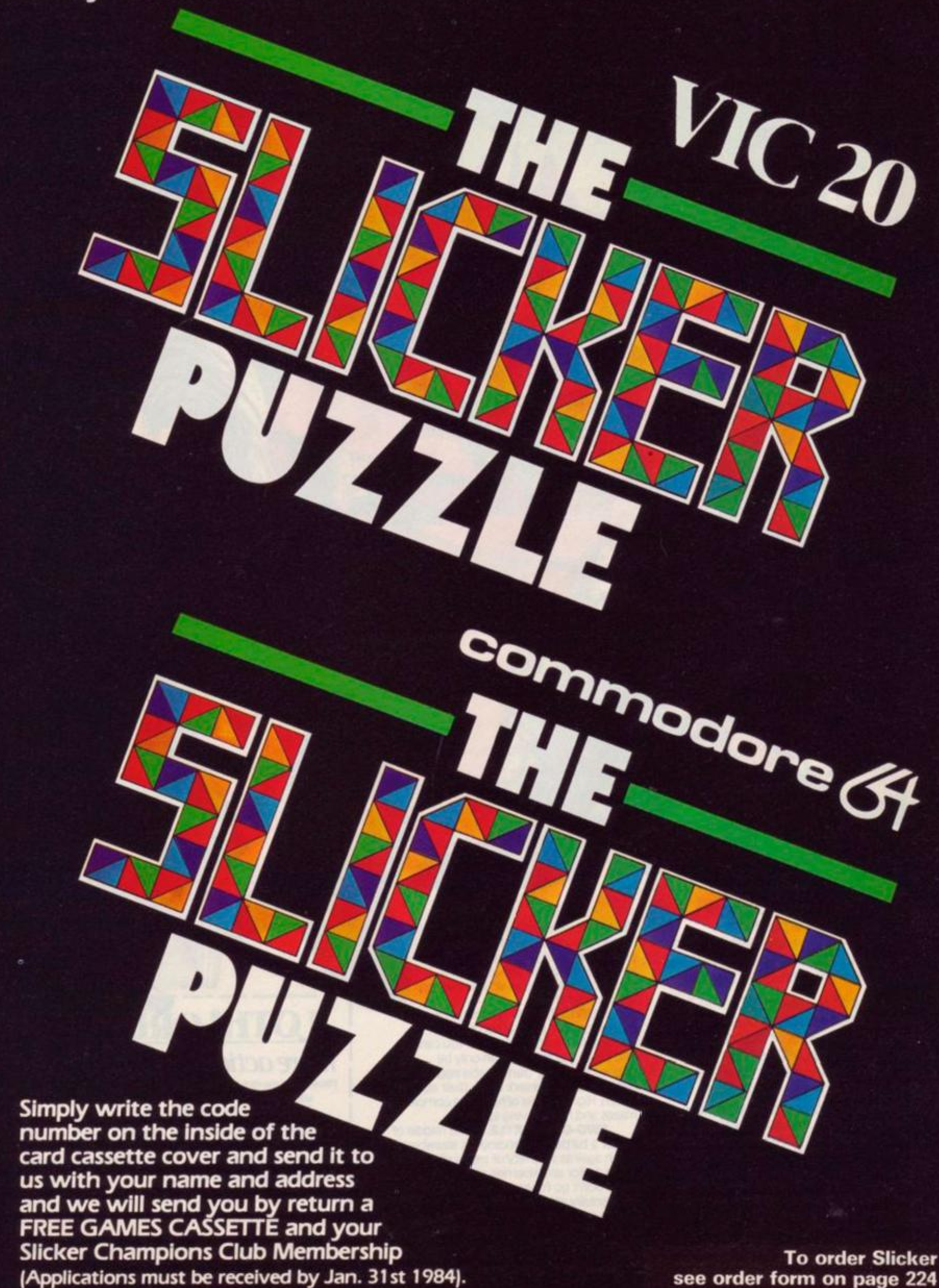



```
96 PRINT"■";
97 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■"TAB(12);T$;"■";
99 PX=36 PRINT"■" PH=1
100 K=PEEK(197) IFK=64THEN120
102 IFK=10ANDPX<>1THENPX=PX-.5
104 IFK=18THENPX=PX+.25
105 IFK=23ANDPH<>2THENGOSUB900
107 IFK=9ANDPH<>1THENGOSUB910
108 IFK=60ANDBF<>2THENB=1024+((PH*2)*40)+(PX-2)-1 BF=2 GOSUB930
120 PX=PX-1 IFPX<1THENPX=40
121 IFBF=2THENGOSUB200
125 PRINT"■" FORI=1TOPH PRINT NEXT
130 PRINTRIGHT$(P$,PX),LEFT$(P$,40-PX)
135 IFRND(1)<INANDGF<>2THENGM=1309 GF=2
136 IFGF=2THENGOSUB950
137 IFRND(1)<INANDTF<>2THENGOSUB1000
138 IFRND(2)<INANDTF<>2THENTM=1066+TX TF=2
139 IFTF=2THENGOSUB1100
140 GOTO100
200 POKEB,32 B=B+39 J=PEEK(B) IFJ<>32THEN210
202 POKEB,28 POKEB+C,9 RETURN
210 I=0
211 IFJ=1THEN230
212 I=I+1 IFI>5THEN220
213 GOTO211
220 POKEB-39,INT(RND(TI)*3)+22 POKEB-39+C,2 FORI=1TO100 NEXT POKEB-39,32 BF=0 R
ETURN
230 I=I+1 IFI>5THENI=32
240 POKEB,I POKEB+C,12 BF=0
241 IFI=32ANDPEEK(B-1)=6THEN250
245 RETURN
250 POKEGM,32 POKETM,32 POKEB,6 POKEB+C,6 POKEB+1,7 POKEB+1+C,6
255 FORX=B+41TO1940STEP40 POKEX,8 POKEX+C,6 NEXT
260 FORYY=1940TOB+1STEP-40 FORX=YYTOYY+35 POKEX,6 POKEX+C,6 NEXTX NEXTYY
275 FORI=1TO1000 NEXT
276 POKE53272,(PEEK(53272)OR15)-11
277 RA=RA+1 IFRA>8THENRA=8
280 PRINT"■"
290 PRINT"■■■■■■■■■■■■■■■MISSION COMPLETE...."
300 PRINT"■■■■■■■■■PRESENT RANK -■"
305 PRINT"■■■■■■■■■";RA$(RA)
310 PRINT"■■■■■■■■■DO YOU WISH TO CONTINUE"
312 PRINT"■■■■■■■■■AT A HARDER LEVEL??"
315 GETA$ IFA$<>"Y"ANDA$<>"N"THEN315
320 IFA$="N"THEN400
330 IN=IN+.1 IFIN>.4THENDA$="DA$+"0"
335 POKE53272,(PEEK(53272)AND240)+12
340 GOTO60
400 PRINT"■"
410 PRINT"■■■■■■■■■■■■■■■■■■■■■YOUR FINAL RANK"
420 PRINT"■■■■■■■■■■■";RA$(RA)
430 FORI=1TO1000 NEXT SYS64738
440 STOP
900 PRINT"■" FORI=1TOPH PRINT NEXT PRINT"
" PH=PH+1
902 RETURN
910 PRINT"■" FORI=1TOPH PRINT NEXT PRINT"
" PH=PH-1
920 RETURN
930 FORI=0TO24 POKEC+I,0 NEXT RETURN
950 POKEGM,32 GM=GM-39 IFPEEK(GM)<>32THEN990
951 IFGM<1064THENPOKEGM,32 GM=1309 GF=0 POKEGM,14 POKEGM+C,9 RETURN
952 POKEGM,15 POKEGM+C,0 RETURN
990 IFPEEK(GM)=21THENRETURN
992 IFPEEK(GM)=28THENPOKEGM,32 GM=1309 RETURN
995 GOTO2000
1000 I=INT(RND(TI)*2)+1 IFI=1THEN1004
1002 IFTX<22THENTX=TX+1 TM=TM+1 GOSUB1010 RETURN
1004 IFTX>6THENTX=TX-1 TM=TM-1 GOSUB1010 RETURN
1010 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■"TAB(TX);T$;"■"; RETURN
1100 POKETM,32 TM=TM-40 IFPEEK(TM)<>32THEN1140
1101 IFTM<1064THENTM=1066+TX TF=0 RETURN
1103 POKETM,21 POKETM+C,0 RETURN
1140 IFPEEK(TM)=15THENRETURN
1145 IFPEEK(TM)=28ORPEEK(TM)=21THENPOKETM,32 TM=1066+TX TF=0 RETURN
1150 GOTO2000
2000 POKETM,32 POKEGM,32 POKEB,32
2010 PL(1)=1024+((PH*2)*40)+(PX-3)-1
2011 PL(2)=PL(1)+1
2012 PL(3)=PL(2)+1
2013 REM
2020 REM
2021 FORJ=1TO3 POKEPL(J),32 NEXT
2022 FORJ=1TO3 PL(J)=PL(J)+39+INT(RND(TI)*3) NEXT
2023 FORJ=1TO3 POKEPL(J),INT(RND(TI)*15)+13 POKEPL(J)+C,INT(RND(TI)*6)+0
2024 NEXT
2025 IFPEEK(PL(1)+40)<>32ANDPEEK(PL(2)+40)<>32ANDPEEK(PL(3)+40)<>32THEN2030
2026 GOTO2021
2030 FORI=1TO20 FORJ=1TO3 POKEPL(J),INT(RND(TI)*3)+22 NEXT NEXT
2035 FORJ=1TO3 POKEPL(J),32 NEXT
2040 POKE53272,(PEEK(53272)OR15)-11
2041 PRINT"■■■■■■■■■■■■■■■■■■■■YOUR PLANE IS A WRECK!!"
2042 PRINT"■■■■■■■■■BUT YOU SURVIVE!"
2043 PRINT"■■■■■■■■■DO YOU WANT TO TRY AGAIN?"
2045 GETA$ IFA$=""THEN2045
2050 IFA$="N"THENSYS64738
2060 IFA$="Y"THENRUN
2070 GOTO2045
3000 PRINT"■■■■■■XVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXW"
3001 PRINT"XVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXW■■"
3002 PRINT"■@@@   @@   @@@        @ @@@ @   @@@ @@@@@"
3003 PRINT"■@  @ @  @ @ @ @       @ @   @   @ @ @ @"
3004 PRINT"■@  @ @  @ @ @ @       @ @   @   @ @ @ @"
3005 PRINT"■@  @ @  @ @ @ @       @ @   @   @ @ @ @"
3006 PRINT"■@  @ @  @ @ @ @       @ @   @   @ @ @ @"
3007 PRINT"■@  @ @@@@ @ @ @  ■FFF@ @@@ @   @@@ @ @ @"
3008 PRINT"■@  @ @  @ @   @       @ @ @   @ @ @   @"
3009 PRINT"■@  @ @  @ @   @       @ @ @   @ @ @   @"
3010 PRINT"■@  @ @  @ @   @       @ @ @   @ @ @   @"
3011 PRINT"■@@@ @  @ @   @      @ @@@ @@@ @ @ @   @"
3012 PRINT"■■■■XVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXW"
3014 PRINT"■XVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXVXW■" RETURN
3100 POKE53272,(PEEK(53272)OR15)-11
3101 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■ INSTRUCTIONS"
3102 GETA$ IFA$=""THENUU=U+1 IFU>20THENU=0 GOTO3110
3103 IFA$<>""THEN3120
3104 GOTO3102
3110 UU=UU+1 IFUU>2THENUU=1
3111 IFUU=1THENPRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■ (■■ES/■■)   " GOTO3102
3112 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■ (■■/■■ES)   " GOTO3102
3120 IFA$<>"N"ANDA$<>"Y"THENPOKE198,0 GOTO3102
3121 IFA$="N"THENPOKE53272,(PEEK(53272)AND240)+12 RETURN
3130 PRINT"■■";CHR$(14);
3140 READX$ IFX$="*"THENPRINTCHR$(13) GOTO3140
3141 IFX$="END"THEN4050
3145 FORX=1TOLEN(X$) PRINTMID$(X$,X,1); FORXX=1TO100 NEXT NEXT
3150 GOTO3140
4000 DATA"■ OUR MISSION -","*","■ESTROY GESTAPO HEADQUARTERS."."*"
4010 DATA"■UGGESTED METHOD -","*","■LOW DAM AND FLOOD THE BUILDING.","*"
4020 DATA"■ OUR ARMOURY -","*","■NLIMITED SUPPLY OF 1001 BOMBS.","*"
4030 DATA"■NTELLIGENCE REPORT -","*","■AM GUARDED BY A BUNKER CONTAINING A  "
4031 DATA"■  MACHINE GUN.ALSO A TANK PATROLS GORGE ATBOTTOM OF THE DAM.","*","*

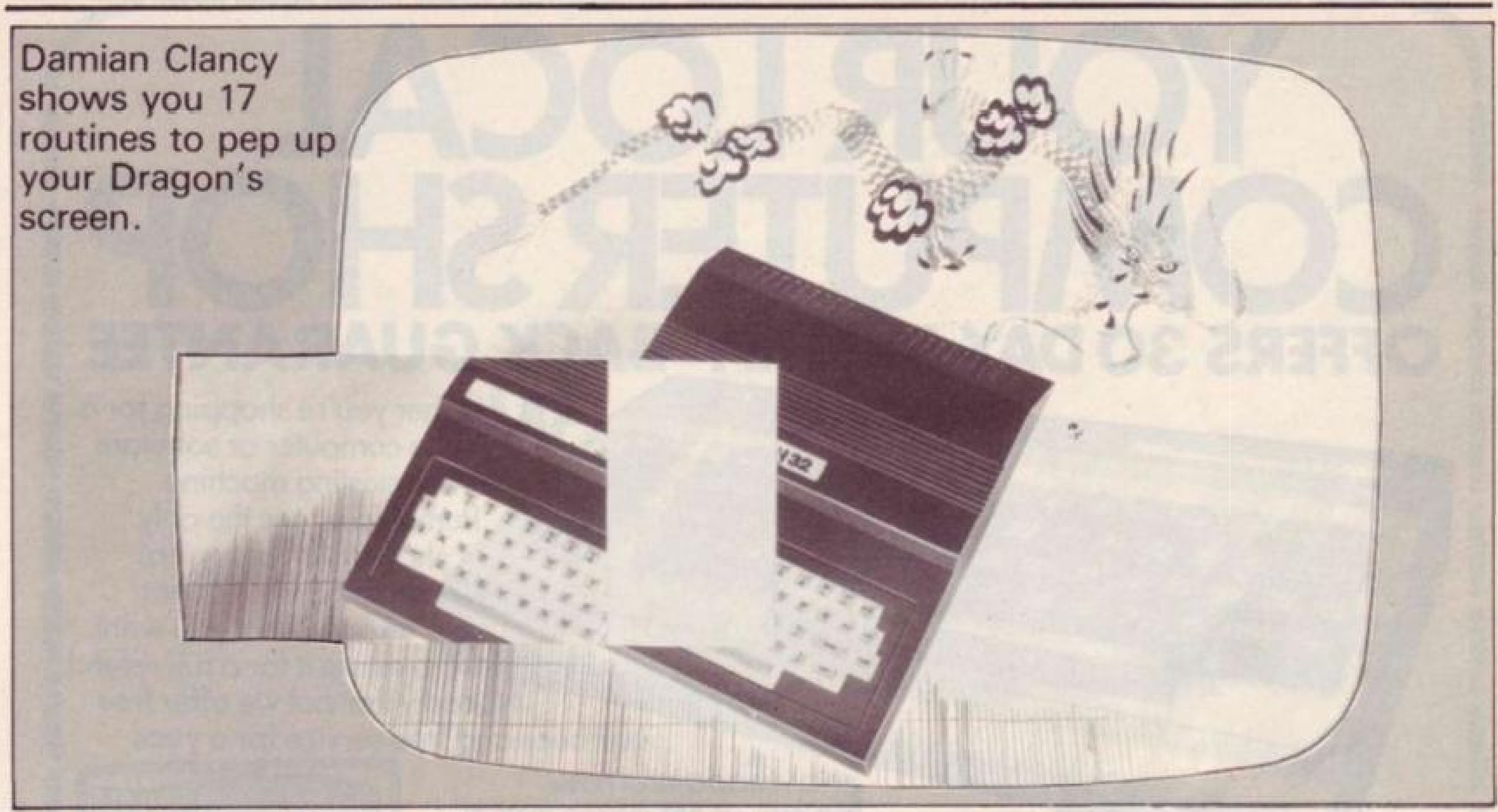
4034 DATA"■IT- L-.......■T, CALL --- ..!!","*"
4035 DATA"*","*","*","*","*","*","*","*","*","*","*","*","■"
4040 DATA"■ONTROLS -","*","*","■NCREASE ALTITUDE WITH  ■■ .","*"
4041 DATA"■ECREASE ALTITUDE WITH  ■■ .","*"
4042 DATA"■NCREASE VELOCITY WITH  ■■ .","*"
4043 DATA"■ECREASE VELOCITY WITH  ■■ .","*"
4044 DATA"■ROP A BOMB WITH  ■■-■ .","*"
4045 DATA"*","■RESS A KEY TO START MISSION.","END"
4050 IFPEEK(197)=64THEN4050
4055 POKE53272,(PEEK(53272)AND240)+12 RETURN
5000 RA$(1)="ERK"
5001 RA$(2)="FLIGHT MECHANIC"
5002 RA$(3)="FLIGHT SERGEANT"
5003 RA$(4)="PILOT OFFICER"
5004 RA$(5)="SQUADRON LEADER"
5005 RA$(6)="WING COMMANDER"
5006 RA$(7)="AIR VICE MARSHAL"
5007 RA$(8)="AIR MARSHAL"
5010 RETURN
```

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SCREEN KIT

HERE ARE 17 routines to enhance the screen of the Dragon 32 and add better sound effects to your progams. The routines will scrool the high resolution or low resolution screens in all four directions, invert either screen, fill the whole low-res screen, the foreground or the background with a specified character, draw a border of a specified character around the screen, and produce two different sound effects.

When the printed program is typed in and Run, it will Poke the routines into memory from address 32000 onwards. The program should then be Saved and all the routines tested.

Each time you wish to use any of the routines in your own programe while the program is under development the routines must be loaded separately before loading your own program. Before loading the routines using CloadM you should type

CLEAR 200,32000

When your own program is finished, before Saving it type:

POKE 27,&H7F : POKE 28,&HFF.

This will allow the routines to be Saved together with the Basic program using the CSave command. However, it will stop you from editing the program and so should only be used when you have finished the program. The routines available are listed in table 1. Type Exec followed by the start address.

When all the routines have been tested and when they work they can be Saved using

CSAVEM "SCREEN",32000,32600,600.

They can be loaded again using CloadM.

```
1 DATA 8E,06,00,A6,01,A7,80,8C
2 DATA 1E,00,26,F7,86,00,8E,1D
3 DATA FF,A7,00,30,88,E0,8C,06
4 DATA 04,2E,F6,39,8E,1D,FF,A6
5 DATA 1F,A7,00,30,1F,8C,06,00
6 DATA 26,F5,86,00,8E,06,00,A7
7 DATA 00,30,88,20,8C,1D,F6,2D
8 DATA F6,39,8E,1D,FF,A6,88,E0
9 DATA A7,00,30,1F,8C,06,20,26
10 DATA F4,8E,06,00,86,00,A7,80
11 DATA 8C,06,20,26,F9,39,8E,06
12 DATA 00,A6,88,20,A7,80,8C,1D
13 DATA E0,26,F6,86,00,A7,80,8C
14 DATA 1E,00,26,F9,39,8E,06,00
15 DATA A6,00,43,A7,80,8C,1E,00
16 DATA 26,F6,39,8E,06,00,68,80
17 DATA 68,80,25,07,8C,12,00,2D
18 DATA F7,20,07,A6,1E,4C,A7,1E
19 DATA 20,F2,8E,11,FF,A6,00,84
20 DATA FE,A7,00,30,10,8C,05,FF
21 DATA 26,F3,39,8E,12,00,64,82
22 DATA 64,82,25,07,8C,06,00,26
23 DATA F7,20,08,A6,01,8B,80,A7
24 DATA 01,20,F1,8E,06,00,A6,00
25 DATA 84,7F,A7,00,30,88,10,8C
26 DATA 12,00,26,F2,39,8E,04,00
27 DATA 8C,06,00,27,29,A6,00,81
28 DATA 40,25,17,81,80,25,19,1F
29 DATA 89,C4,F0,84,0F,43,F7,7F
30 DATA FF,84,0F,BB,7F,FF,A7,80
31 DATA 20,DE,8B,40,A7,80,20,D8
32 DATA 8B,C0,A7,80,20,D2,39,8E
33 DATA 04,00,A6,01,A7,80,8C,06
34 DATA 00,26,F7,86,60,8E,05,FF
35 DATA A7,00,30,88,E0,8C,04,06
36 DATA 2E,F6,39,8E,05,FF,A6,1F
37 DATA A7,00,30,1F,8C,04,00,26
```

(listing continued on page 175)



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(continued from page 173)

```
38 DATA F5,86,60,8E,04,00,A7,00
39 DATA 30,88,20,8C,05,FA,2D,F6
40 DATA 39,8E,05,FF,A6,88,E0,A7
41 DATA 00,30,1F,8C,04,1F,26,F4
42 DATA 8E,04,00,86,60,A7,80,8C
43 DATA 04,20,26,F9,39,86,04,8E
44 DATA 04,00,A7,89,01,E0,A7,80
45 DATA 8C,04,20,26,F5,A7,1F,A7
46 DATA 00,30,88,20,8C,06,00,26
47 DATA F4,39,86,04,8E,04,00,A7
48 DATA 80,8C,06,00,26,F9,39,86
49 DATA 04,8E,04,00,E6,00,C1,60
50 DATA 26,08,A7,80,8C,06,00,26
51 DATA F3,39,30,01,20,F6,86,04
52 DATA 8E,04,00,E6,00,C1,60,27
53 DATA 08,A7,80,8C,06,00,26,F3
54 DATA 39,30,01,20,F6,86,3F,B7
55 DATA FF,23,C6,00,F7,7F,FF,7C
56 DATA 7F,FF,F6,7F,FF,5A,C1,00
57 DATA 26,FB,86,40,B7,FF,24,F6
58 DATA 7F,FF,5A,C1,00,26,FB,4F
59 DATA B7,FF,24,B1,7F,FF,26,DF
60 DATA 39,00,86,3F,B7,FF,23,C6
61 DATA FF,F7,7F,FF,7A,7F,FF,F6
62 DATA 7F,FF,5A,C1,00,26,FB,86
63 DATA 40,B7,FF,24,F6,7F,FF,5A
64 DATA C1,00,26,FB,4F,B7,FF,24
65 DATA B1,7F,FF,26,DF,39
100 CLEAR 200,32000
110 FOR F=32000 TO 32517
120 READ A$:POKE F,VAL("&H"+A$)
130 NEXT F
```

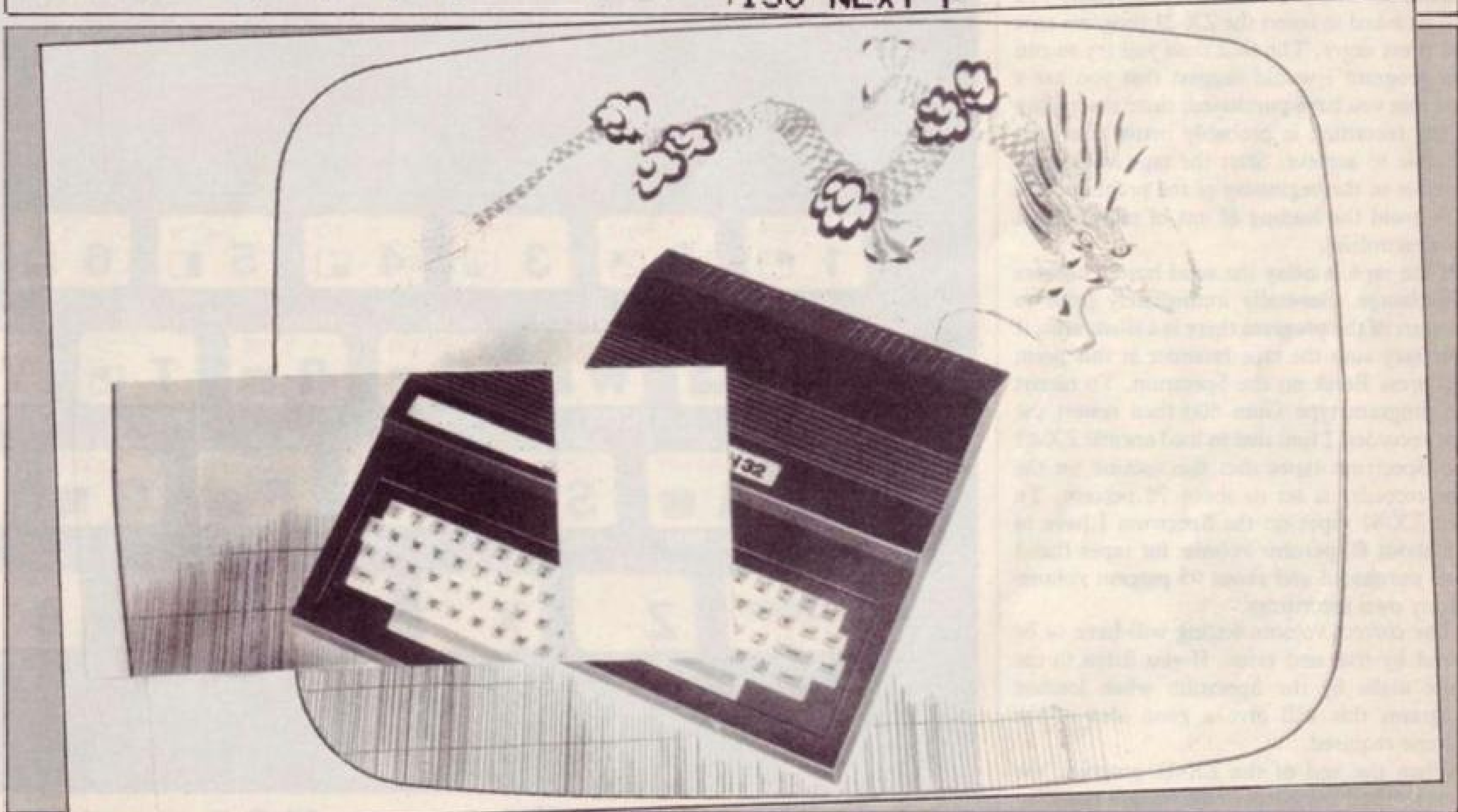


Table 1. High-resolution routines

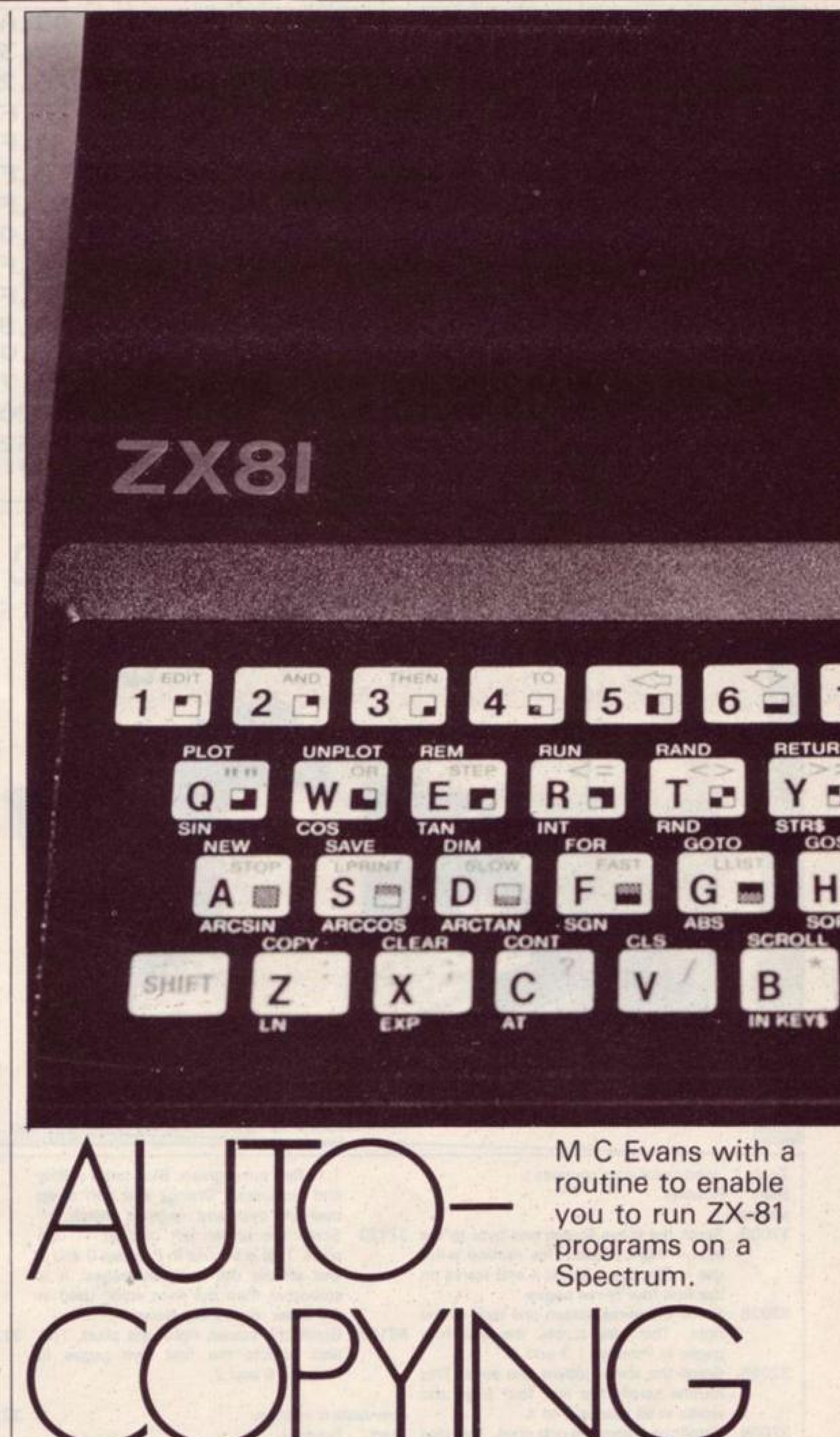
Start address	Routine
32000	Scroll the hi-res screen one byte to the left — eight pixels. This routine is for use in Pmodes 1,3 and 4 and works on the first four hi-res pages.
32028	Scroll the hi-res screen one byte to the right. This also scrolls the first four pages in Pmodes 1,3 and 4.
32058	Scroll the screen down one pixel. This routine scrolls the first four page and works in all modes 0 to 4.
32086	Scroll the screen up one pixel. This also scrolls the first four pages in Pmodes 0 to 4. However, when used in Pmodes 0,1 and 2 the Exec command should be followed by the command line (0,191)-(255,191),Preset.
32109	Invert the hi-res screen. This inverts the first four pages in all modes. Green pixels and buff pixels turn black, black turns green or buff depending on whether you are in Screen 1,0 or screen 1,1. Red turns green, Blue turns yellow and vice-versa. Orange and buff swap over and cyan and magenta switch.
32123	Scroll the screen left one bit — one pixel. This is for use in Pmodes 0 and 2 and affects the first two pages. It is smoother than the byte scroll used in the other modes but slower.
32163	Scroll the screen right one pixel. This also affects the first two pages in Pmodes 0 and 2.

Low-restext routines

Start address	Routine
32205	Invert the screen.
32255	Scroll the screen left one character.
32283	Scroll the screen right one character.
32313	Scroll the screen down one character. There is no routine to scroll the text screen up as this can be done with the simple Basic command Print at 480.
32341	Draw a border of a specified character around the screen. The poke code of the character used should be poked into location 32342 before calling the routine using Exec. The Poke codes are slightly different than the ASCII codes listed at the back of the manual. To find the Poke code of a character with ASCII code X, use Print at 0,Chr$(X);:Print Peek (1024)
32370	Fill the screen with a specified character. The character's Poke code should first be Poked into address 32371.
32383	Fill the background with a character. All the spaces on the screen are filled with the character whose Poke code is in address 32384.
323406	Fill the foreground with a character.

Sound routines

Start address	Routine
32429	Laser/Phasor/Zap
32474	Swanee whistle. When used several times at once produces a siren noise.



AUTO-COPYING

M C Evans with a routine to enable you to run ZX-81 programs on a Spectrum.

THIS PROGRAM, WRITTEN for the 48K Spectrum, will load ZX-81 program tapes and transform them so they are able to run on the Spectrum.

After the Basic program has been typed in from the program listing, which should not present any problem, run from line 9900 which will Save and Verify the program on tape.

When the Basic program has been Saved run from line 10. First the C() array will be filled with the Spectrum codes in the ZX-81 position, and the machine-code programs will be Poked into the correct location. All this information is held in data statements from line 9000 onwards. At the end of each data line there is a check-sum digit for the line. If an error occurs when the offending line will be listed ready for editing. After the line is corrected, restore the data and Run the program again.

Once the data has been loaded correctly you will be asked to insert the ZX-81 program tape and press enter. The first time you try to run this program I would suggest that you use a tape that you have purchased, since the quality of the recording is probably better than you are able to achieve. Start the tape as close as possible to the beginning of the program, this is to avoid the loading of lots of noise from a poor recording.

If the tape is noisy the solid border colours will change. Generally immediately prior to the start of the program there is a silent area; if necessary stop the tape recorder at this point and press Break on the Spectrum. To restart the program type Goto 500 then restart the tape recorder. I find that to load normal ZX-81 and Spectrum tapes that the volume on the tape recorder is set to about 75 percent. To load ZX-81 tapes on the Spectrum I have to use about 80 percent volume for tapes that I have purchased and about 95 percent volume for my own recordings.

The correct volume setting will have to be found by trial and error. If you listen to the noise made by the Spectrum when loading programs this will give a good idea of the volume required.

When the end of the ZX-81 program has been reached the border colours will revert to the solid changing colours. At this point press the Space-key — not Shift space or Break. The Basic program will then continue by asking for the name of the ZX-81 program that you have just loaded. The Basic program will then proceed to try and find the name among the information it has read from the tape.

When the ZX-81 program is being loaded, all the information that comes from the tape recorder is stored as it is received. This may mean, if the tape was noisy prior to the start of the program, that the program name is not at its correct position. The Basic program therefore looks at the first few storage locations to see if it can find the name.

If it cannot, it will then shift each bit along one position and repeat the search up to eight times for the program name. If the program name is not found, change the tape recorder settings and start the program again from line 500. If you still fail to find the program name then it will be necessary to re-record the ZX-81 program taking great care to produce the best quality recording you can. If you entered the wrong program name, then restart the Basic program from line 1000 and enter the correct name.

If you still fail to find the program name then it will be necessary to re-record the ZX-81 program taking great care to produce the best quality recording you can. Alternatively it may be possible to transfer the program directly from the ZX-81 to the Spectrum using a tape recorder and amplifier from an audio system. To do this, first load the program into the ZX-81. Then connect the Mic lead from the ZX-81 to the microphone input of the tape recorder, if it is stereo remember which channel you are using.

Connect the headphone output of the amplifier to the Ear lead of the Spectrum; if it

is a stereo amplifier turn the balance control so that only the correct channel is being used. Put a tape in the recorder and start recording, this will link the tape recorder and amplifier. Start the Basic program in the Spectrum from line 500 and finally instruct the ZX-81 to save its program.

This causes the ZX-81 program to be simultaneously recorded on tape, which can then be discarded, and lay the recording signal directly to the Spectrum, which thinks it is reading a tape. I found that the best results were obtained when as few as possible modifications were made to the recording signal, i.e., no Dolby, peak noise filter, bass, treble and other sound enhancements. Despite the number of leads and power supplies required, I found this method to be the most trouble-free. It also works Spectrum to Spectrum.

Having found the name of the ZX-81 program, the rest of the program is then converted so that it is able to run on the Spectrum with the following differences to statements.

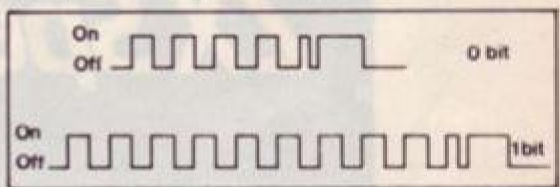
Slow, Fast, Poke and Usr are replaced with Rem to stop the converted program accidently crashing. Unplot is replaced with Plot and the shaded ZX-81 graphic characters are replaced with Spectrum's user definable graphics — which you will have to define later.

If a legitimate Rem statement is encountered, you are asked if the line contains machine code and, if so, if you want to Save the machine code on tape.

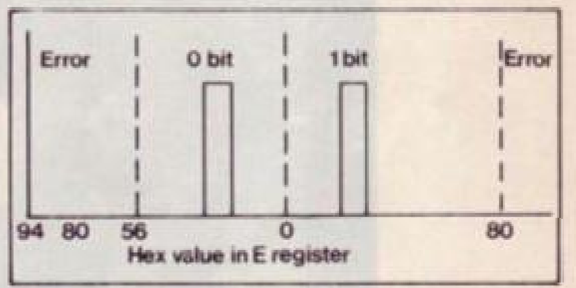
After the ZX-81 program has been converted you are prompted for a program name so the converted program can be Saved on tape. The Saved program can then be loaded back into the Spectrum as a normal Spectrum program. Most programs that are free of Peek, Poke and User statements are then able to run without any further modifications.

If having found the name an error occurs during the conversion, you will be prompted to Save the program, so far converted, on tape. After the program has been Saved an attempt is made to find a new entry point into the ZX-81 program. Thus several sections of the ZX-81 programs can be Saved on tape and later using the Spectrum's Merge command, the programs combined together into one program, plus a few gaps. If errors do occur it is indicative of wrong volume setting or a poor recording.

There are also four machine-code programs used by the Basic program during the course of loading and converting the ZX-81 program. The first machine-code program interprets the ZX-81 tape signals and stores each bit of information as it is received. The signal on a ZX-81 tape has the following form:



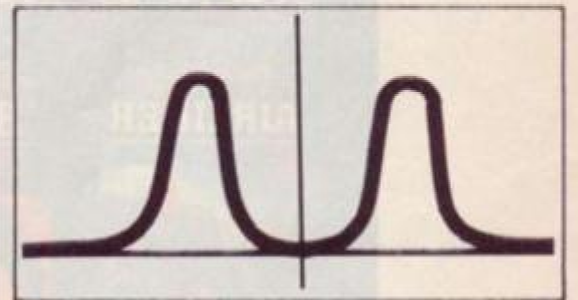
There are four or nine regular on and off signals — indicating 0 bit or 1 bit respectively — followed by a short on and off followed by a long on and off — which indicates the end of the bit. In the ZX-81 these signals are decoded by counting the time between reaching the start of the long off signal, from the previous bit, and deciding that the long on has been reached. The distribution of time taken to decode a bit looks like this.



The E register is used as a counter and starts with the value Hex 94, decreasing by one each time it passes through the loop. A long on signal is deemed to have been reached when the signal has been on for 26 loops.

If the long on is reached prior to the counter reaching Hex 56 then an error is assumed to have occurred and the counter starts again from Hex 94. If an error occurs anywhere else but the first bit, then the program will not load correctly. If a valid long on occurs before the counter reaches Hex 00 then the bit is an 0, otherwise the bit is 1. The grouping of time for the 0's and 1's is very compact and the ZX-81 seems difficult at interpreting the signal.

If the same procedure is followed on the Spectrum the following distribution occurs:



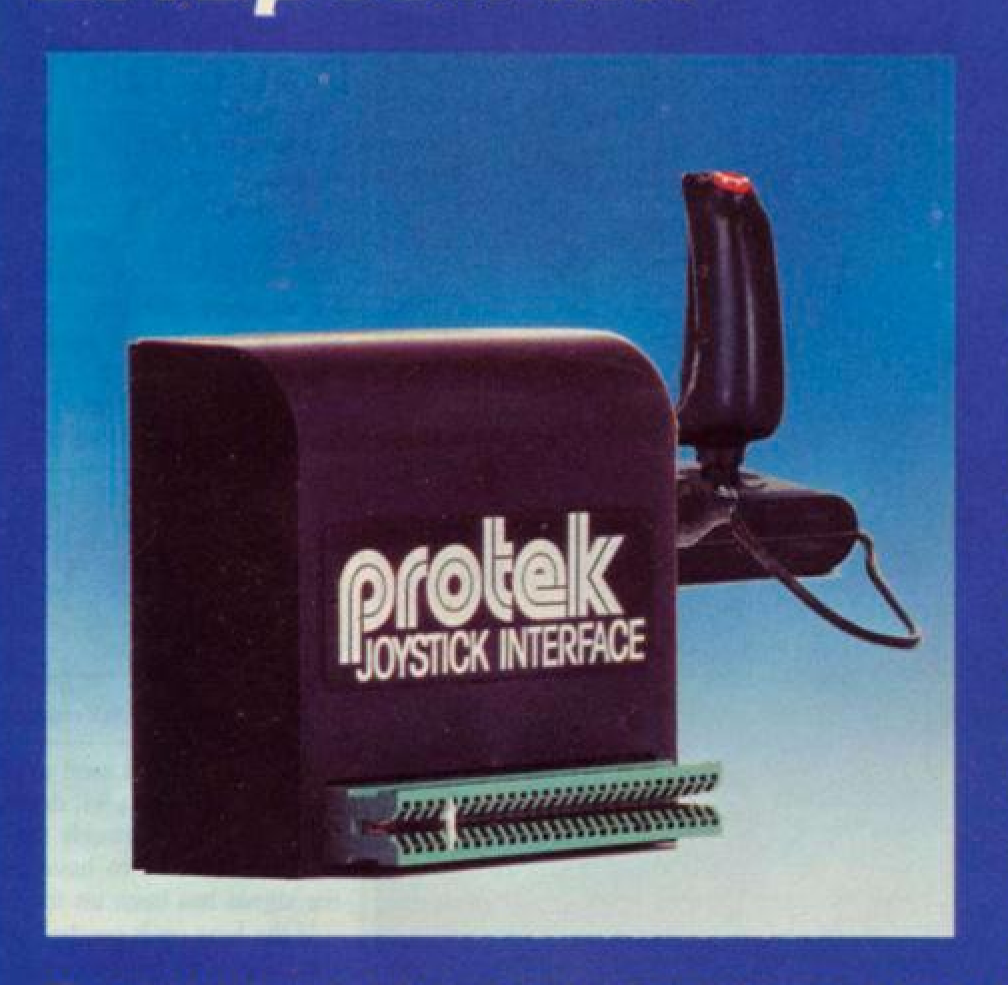
Instead of the grouping being compact, they appear like the statistical normal distribution with the accompanying tails. To get the distribution into the same form, the setting of the volume and tone controls on the tape

(continued on page 181)

PLAY TH

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If you want Arcade quality control for your Sinclair ZX Spectrum, you'll find the Protek combination hard to beat. The interface is compatible with a range of software including a number of titles from: ULTIMATE, SILVERSOFT, RABBIT SOFTWARE, QUICKSILVER, QUEST, PSION, NEW GENERATION SOFTWARE, IMAGINE, OCEAN, plus many more.

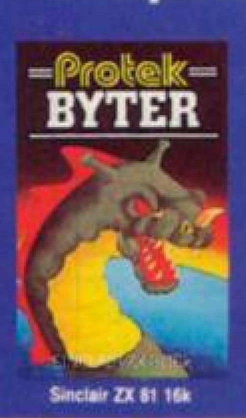
The protek joystick interface is simple to use. It just plugs in at the back of your Spectrum and is compatible with any "Atari type" Joystick Connector. We recommend the Spectravision Joystick at only £9.95 for Pistol Grip Joystick with a top and base fire button plus specially contoured shape and rubber suction cup footing for single hand operation.

Protek JOYSTICK INTERFACE £14.95

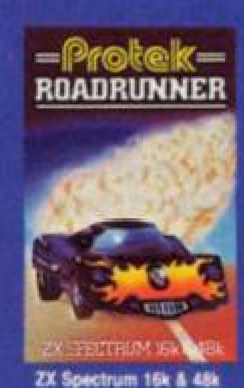
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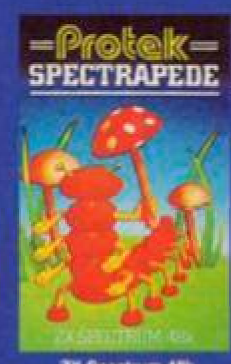
ZX Spectrum 16k & 48k



Sinclair ZX 81 16k



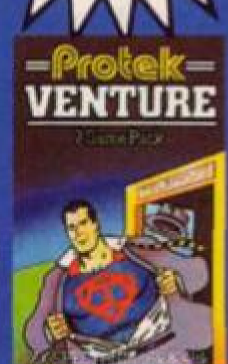
ZX Spectrum 16k & 48k




ZX Spectrum 48k



Sinclair ZX 81 16k



ZX Spectrum 16k & 48k

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YC 12

(continued from page 177)

recorder are critical — which is not the case on the ZX-81 — otherwise the distribution looks rectangular.

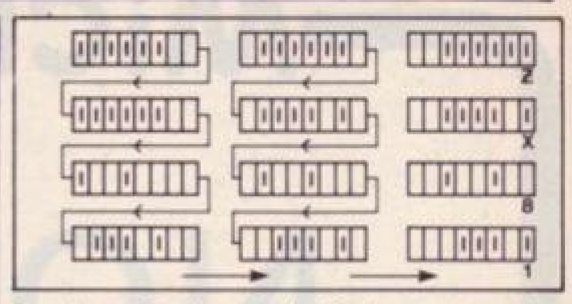
The next problem is that different tape recorder settings cause the peaks, and more importantly the tails, of the distribution to move. This then leads to the tail crossing the boundary between a 0 and 1 bit.

These differences between the ZX-81 and the Spectrum mean that it is not possible to use the ZX-81 method of decoding the tape signal and this is why greater care has to be taken when recording the ZX-81 programs to avoid the square shape of the signal becoming unduly rounded thus making it difficult to pick out the long on signal correctly.

The problem of knowing when the end of a bit has been reached is overcome by going back to first principles. By counting the on signals and looking at the long on signal to see if it occurs roughly on the fifth or 10th signal. The loading routine is the first of the machine-code programs and is very straight forward and simply reads the tape and stores each bit as it comes from the tape for interpretation later.

This leads to the problem that if there is any noise on the tape prior to the start of the program then the program itself will not be at the start location and each bit of data may not be at its correct position in the byte.

After a program has been loaded into the memory the next problem is to get each bit into correct position within the byte. This is done by the second machine code program trying to find the name of the ZX-81 program somewhere within the first few storage



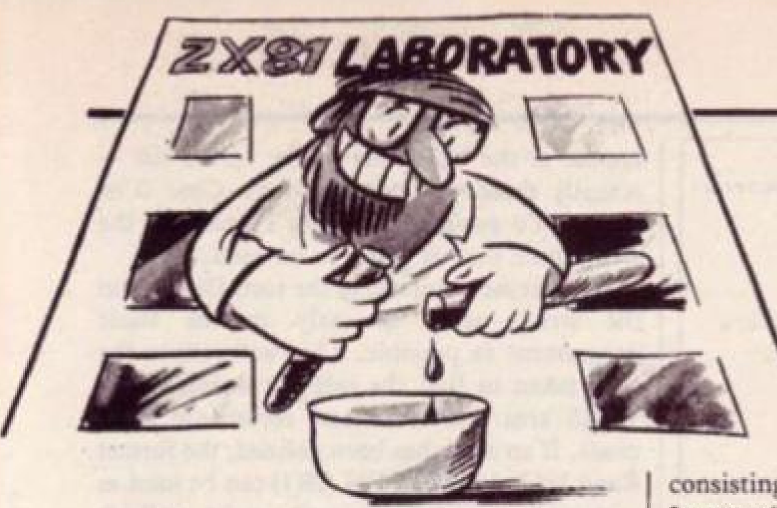
locations. To do this the Basic program first asks for the name of the program already loaded, then looks at about the first twenty locations to see if the name occurs, if it does not then each bit is moved one place, as shown below, until the name is found.

The third machine-code program is used to find a new entry point into the ZX-81 program by looking through the 16K storage area to see if it can find a code 118 (NEWLINE).

```
  10 REM ************************
         * ( ZX81 PROGRAMS )    *
         * ( BY M.C. EVANS )    *
         * ( SEPTEMBER 1983)    *
         ************************
  20 CLEAR 40000
  30 DEF FN A(A)=A-256*INT (A/25
6)
  40 POKE 23658,8
  50 LET LOAD=48896: LET BITSH=L
OAD+78: LET FEOBL=BITSH+13: LET
SAVESP=FEOBL+18
  60 LET PROG=49152: LET IX=4912
0
 100 REM
          READ C.S. DATA
 110 CLS : PRINT AT 10,8; INVERS
E 1;"READING DATA"; INVERSE 0
 120 DIM C(256)
 130 LET T=0
 140 FOR N=1 TO 256
 150 READ A: LET C(N)=A: LET T=T
+A
 160 IF N=32*INT (N/32) THEN REA
D A: LET T=T-A: IF T<>0 THEN PRI
NT "DATA ERROR ": LIST (9000+INT
 (N/32)): STOP
 170 NEXT N
 200 REM
          STORE MACHINE CODE
 210 LET T=0
 220 FOR N=1 TO 124
 230 READ A: POKE LOAD-1+N,A: LE
T T=T+A
 240 IF N=31*INT (N/31) THEN REA
D A: LET T=T-A: IF T<>0 THEN PRI
NT "DATA ERROR ": LIST (9010+INT
 (N/31)): STOP
 250 NEXT N
 260 BEEP 1,1
 500 REM
          LOAD ZX81 PROGRAM
 510 CLS : PRINT AT 10,1; INVERS
E 1;"INSERT ZX81 TAPE & PRESS EN
TER"; INVERSE 0;AT 20,0;"(Press
SPACE) to continue       at end
of ZX81 program"
 520 IF INKEY$="" THEN GO TO 520
 530 LET ERR=0
 540 RANDOMIZE USR LOAD
 550 CLS
1000 REM
          FIND PROGRAM NAME
1010 INPUT "ENTER PROGRAM NAME "
;P$: LET A=LEN P$-1: IF A<1 THEN
 PRINT AT 21,0;"NAME TO SHORT":
GO TO 1010
1012 PRINT P$
1015 FOR J=1 TO 8
1017 FOR N=PROG TO PROG+15: PRIN
T CHR$ C((1+PEEK N));: NEXT N: P
RINT
1020 FOR N=1 TO A
1030 FOR M=PROG TO PROG+15-A
1040 IF C(1+PEEK M)=CODE P$(N) A
ND N<A THEN LET AD=M: GO TO 1100
1050 NEXT M
1060 NEXT N
1070 RANDOMIZE USR BITSH
1080 NEXT J
1090 PRINT "PROGRAM NAME NOT FOU
ND": GO TO 9999
1100 FOR I=N TO A
1120 IF C(1+PEEK AD)<>CODE P$(I)
 THEN GO TO 1050
1130 LET AD=AD+1
1140 NEXT I
1150 PRINT : PRINT "FILE NAME FO
UND": PRINT
1160 IF PEEK AD<128 THEN LET AD=
AD+1: GO TO 1160
1170 LET AD=AD+117
1180 LET STA=AD
1190 LET EAD=AD
1200 LET ERR=0
2000 REM
          CHANGE ZX81 PROGRAMS
          TO SPECTRUM PROGRAMS
2005 POKE 23692,255
2010 LET A$="   "+STR$ (256*PEEK
 AD+PEEK (AD+1))
2020 PRINT A$(LEN A$-3 TO );
2030 LET LL=PEEK (AD+2)+256*PEEK
 (AD+3)
2040 LET AD=AD+4
2050 LET A=AD+LL-1: IF A>65535 T
HEN LET ERR=1: GO TO 2400
2060 IF PEEK A<>118 THEN LET ERR
=1: GO TO 2400
2070 LET EAD=A
2100 LET V=PEEK AD
2110 IF V=126 THEN POKE AD,14: L
ET AD=AD+6: GO TO 2200
2120 LET A=C(1+V)
2130 POKE AD,A: PRINT CHR$ A;
2140 LET AD=AD+1
2150 IF V=11 THEN GO TO 4000
2160 IF V=234 THEN GO TO 5000
2200 IF AD>EAD THEN LET ERR=1: G
O TO 2400
2210 IF AD<EAD THEN GO TO 2100
2300 POKE AD,13: PRINT
2310 LET AD=AD+1
2320 IF PEEK AD<>118 THEN GO TO
2000
2400 IF ERR=1 THEN PRINT INVERSE
 1;" ERROR ": INVERSE 0
2410 POKE (EAD+1),128
3000 REM
          SAVE CONVERTED PROGRAM
3010 POKE IX,0
3020 INPUT "PROGRAM NAME ";S$: L
ET S$=S$+"          ": FOR N=1 TO
 10: POKE IX+N,CODE S$(N): NEXT
N
3030 LET TL=EAD-STA+2
3040 POKE IX+11,FN A(TL)
3050 POKE IX+12,INT (TL/256)
3060 POKE IX+13,0
3070 POKE IX+14,128
3080 LET PL=EAD-STA+1
3090 POKE IX+15,FN A(PL)
3100 POKE IX+16,INT (PL/256)
3110 POKE IX+17,FN A(STA)
3120 POKE IX+18,INT (STA/256)
3200 RANDOMIZE USR SAVESP
3210 IF ERR=0 THEN GO TO 9999
3500 REM
          SEARCH FOR NEW ENTRY
3510 PRINT "SEARCH FOR NEW ENTRY
 POINT"
3520 FOR B=1 TO 8
3530 PRINT B
3540 POKE 23728,0: POKE 23729,19
2
3550 RANDOMIZE USR BITSH
3560 LET AD=USR FEOBL
3570 IF AD<64430 THEN LET A=AD+P
EEK (AD+2)+256*PEEK (AD+3)+3: IF
 A<65536 THEN IF PEEK A=118 THEN
 LET STA=AD: LET ERR=0: GO TO 20
00
3580 IF AD>PROG THEN GO TO 3560
3590 NEXT B
3600 PRINT "NO NEW ENTRY POINT F
OUND"
3610 GO TO 9999
4000 REM
          PRINT """'S STATEMENTS
4010 LET V=PEEK AD
4020 LET A=C(1+V)
4030 POKE AD,A: PRINT CHR$ (A);
4040 LET AD=AD+1
4050 IF V<>11 THEN GO TO 4000
4060 GO TO 2200
5000 REM
          "REM" STATMENTS
5010 IF EAD=AD THEN GO TO 2200
5020 LET A=22: IF EAD-AD<A THEN
LET A=EAD-AD
5030 FOR N=AD TO AD+A: PRINT CHR
$ C(1+PEEK N);: NEXT N
5040 INPUT "IS THIS A MACHINE CO
DE PROGRAM (Y/N) ";A$: IF A$<>"
Y" AND A$<>"N" THEN GO TO 5040
5050 IF A$="Y" THEN GO TO 5100
5060 IF EAD-AD>A THEN FOR N=AD+A
+1 TO EAD-1: PRINT CHR$ C(1+PEEK
 N);: NEXT N
5070 FOR N=AD TO EAD-1: POKE N,C
(1+PEEK N): NEXT N
5080 LET AD=EAD
5090 GO TO 2200
5100 INPUT "SAVE M.C. TO TAPE (Y
/N) ";A$: IF A$<>"Y" AND A$<>"N"
 THEN GO TO 5100
5110 IF A$="N" THEN GO TO 5200
5120 INPUT "FILE NAME? ";A$: IF
LEN A$>10 OR LEN A$<1 THEN GO TO
 5120
5130 SAVE A$CODE AD,(EAD-AD)
5140 PRINT : PRINT : PRINT "REWI
ND TAPE": PRINT
5150 VERIFY A$CODE AD
5200 LET AD=EAD
5210 GO TO 2200
9000 REM
          ZX81 TO SPECTRUM
          CHARACTER SET
9001 DATA  32,130,129,131,136,13
8,137,139,144,145,146, 34, 96, 3
6, 58, 63, 40, 41, 62, 60, 61, 4
3, 45, 42, 47, 59, 44, 46, 48, 4
9, 50, 51,2482
9002 DATA  52, 53, 54, 55, 56, 5
7, 65, 66, 67, 68, 69, 70, 71, 7
2, 73, 74, 75, 76, 77, 78, 79, 8
0, 81, 82, 83, 84, 85, 86, 87, 8
8, 89, 90,2342
9003 DATA 165,166,167, 63, 63, 6
3, 63, 63, 63, 63, 63, 63, 63, 6
3, 63, 63, 63, 63, 63, 63, 63, 6
3, 63, 63, 63, 63, 63, 63, 63, 6
3, 63, 63,2328
9004 DATA  63, 63, 63, 63, 63, 6
3, 63, 63, 63, 63, 63, 63, 63, 6
3, 63, 63, 63, 63, 63, 63, 63,
7, 13, 12, 63, 63, 63, 63, 63, 6
3, 63, 63,1859
9005 DATA 143,141,142,140,135,13
3,134,139,147,148,149, 34, 96, 3
6, 58, 63, 40, 41, 62, 60, 61, 4
3, 45, 42, 47, 59, 44, 46, 48, 4
9, 50, 51,2526
9006 DATA  52, 53, 54, 55, 56, 5
7, 97, 98, 99,100,101,102,103,10
4,105,106,107,108,109,110,111,11
2,113,114,115,116,117,118,119,12
0,121,122,3174
9007 DATA  39,172,173, 63,175,17
6,177,178,179,180,181,182,183,18
4,185,186,187,188,189,190,192,19
3,194,195, 94,197,198,199,200,20
1,203,204,5679
9008 DATA 205,224,225,226,234,23
4,230,234,232,233,234,235,236,23
7,238,239,240,241,242,243,244,24
5,246,247,248,249,250,251,245,25
3,254,255,7640
9010 REM
          MACHINE CODE PROGRAMS
9011 DATA  33,  0,192,243, 52,  1
5,211,254,219,254, 31,230, 32,24
6,  2, 57, 14,  1, 38,  0,122,  4
7, 37,230,  7,248,  8,211,254,  3
2,127,3557
9012 DATA 219,254, 31, 48, 40,  6
0, 32,246,219,254, 60, 40,251,  2
5,  6, 38,219,254, 60, 40,224,  1
6,249,123,254,  4, 56,217,254,  1
2, 48,3854
9013 DATA 211,254,  7, 63,203,  1
7, 48,204,113, 35,124,181, 32,19
6,251,201, 33,  0,192,167,245,24
1, 86,203, 26,114,245, 35,124,18
1, 32,4064
9014 DATA 245,241,201,237, 75,17
6, 92, 10,  3,254,118,237, 67,17
6, 92,200,120,177, 32,243,201,  4
2,241,191,221, 33,224,191,195,11
2,  9,4656
9900 SAVE "zx81-progs"
9910 PRINT "REWIND TAPE"
9920 VERIFY "zx81-progs"
9999 STOP
```



VICTORIA
BELGRAVIA
WESTMINSTER
SW1
Royal Mews
BUCKINGHAM GATE
VAUXHALL
ECCLESTON
BELGRAVE
Coach Station
Airway Terminal
PIMLICO
Westminster Abbey
Tate Gallery



BUBBLE SORT

Andy Scott shows you how to rearrange numbers or strings.

MOST DATA-PROCESSING programs usually require the use of a sort at least once; for instance, the arrangement of a register of people's names into alphabetical order, the arrangement of football league tables into order according to the number of points accumulated . . . the list is endless. As can be seen by these examples, a sort is the rearranging of numbers or strings into ascending or descending alphanumerical order.

The main problem with sorts is that the more items that are required to be sorted, the longer the sort takes — but on a timescale increasing by the square of the number of items. Larger sorts require very sophisticated algorithms to keep this time down.

One of the most popular and easily understood sort algorithms is the bubble sort. Although not particularly efficient above about 50 items it is still nevertheless a good general-purpose sort. Also, since the sort described here is in machine code, its operation time is faster than a Basic counterpart.

It was decided to take the general case of sorting strings as opposed to numbers — it is comparatively easy to convert numbers to strings by using, for example, STR$ 1234. In the example described by the flow chart, the data items are stored in a string array A$(B,C) consisting of B strings, each C characters long. In practice, any name can be used for the programme to work, for example Z$(B,C).

The routine can be used with any sized ZX-81. Reference to page 174 in the Sinclair manual explaining how string arrays are stored within the ZX-81 may be necessary for complete understanding of the machine-code listing.

Note that the USR entry point is at hex 4090. One problem was how to tell the routine which string array it had to sort. This needed to be put into a Basic programme without affecting its operation and without creating a syntax error during entry of the Basic line. It was decided to call the routine by:

```
RAND USR 16528 + LEN A$(1)
```

where A$ is the name of the string array — it could equally be called S$,Z$, etc. Of particular interest is the use of the IX and IY registers which, according to the Sinclair manual, are banned from use for fear of crashing. After studying Sinclair's use of these registers, it can be assured that the sort programme has no adverse affect on the operation of the ZX-81. The two Halt instructions at the beginning of the listing are there to prevent the characters within the Rem statement from being listed onto the screen.

Use program 1 to load the machine-code programme. The machine code will sit in the Rem statement in line 1. After typing Rem, follow it with 258 characters — I usually use

(continued on next page)

Table 1.

No. of items	Length of strings	Possible number of different characters in strings	Machine-code programme		Basic (Fast)	
10	25	6 (2)	<0.5sec	(<0.5sec)	4.5sec	(8sec)
20	25	6 (2)	<0.5sec	(<0.5sec)	17sec	(33sec)
50	25	6 (2)	1.5sec	(2sec)	2m 5s	(4m 53s)
100	25	6 (2)	6.4sec	(7.7sec)	12m 11s	(>20m)
225	25	6 (2)	42sec	(53sec)	—	
100	10	6 (2)	3.5sec	(4.6sec)	11m 16s	(—)
255	10	6 (2)	23sec	(32.5sec)	—	
10	255	6 (2)	<0.5sec	(0.8sec)	6sec	(6.6sec)
10	1	6 (2)	<0.5sec	(<0.5sec)	3.3sec	(1.7sec)
100	1	6 (2)	0.8sec	(0.7sec)	5m 12s	(4m 4s)
255	1	6 (2)	4.7sec	(3sec)	—	

Machine-code listing.

```
4082            76        HALT
4083            76        HALT
4084  NAME      00
4085  1STDIM    00
4086  2NDDIM    00
4087  FLAGS     00
4088  STRST     0000
408A  TEMPIX    0000
408C  TEMPIY    0000
408E            0000
4090  BEGIN     CD230F    CALL 0F23,FAST
4093            2A1640    LD   HL,(CH-ADD)
4096            23        INC  HL
4097            23        INC  HL
4098            7E        LD   A,(HL)
4099            F6C0      OR   C0H
409B            CBAF      RES  5,A
409D            328440    LD   (NAME),A
40A0            2A1040    LD   HL,(VARS)
40A3  NEWNAME   7E        LD   A,(HL)
40A4            FE80      CP   80H
40A6            2005      JR   NZ,40AD,OK
40A8            CD2B0F    CALL 0F2B,SLOW
40AB            CF        RST  08H
40AC            01        DEFB 01H
40AD  OK        57        LD   D,A
40AE            3A8440    LD   A,(NAME)
40B1            BA        CP   D
40B2            2806      JR   Z,40BA,INITIATE
40B4  NOTFOUND  CDF209    CALL 09F2
40B7            EB        EX   DE,HL
40B8            18E9      JR   40A3,NEWNAME
40BA  INITIATE  23        INC  HL
40BB            23        INC  HL
40BC            23        INC  HL
40BD            3E02      LD   A,02H
40BF            BE        CP   (HL)
40C0            2805      JR   Z,40C7,DIM
40C2  ERROR     CD2B0F    CALL 0F2B,SLOW
40C5            CF        RST  08H
40C6            0D        DEFB 0D
40C7  DIM       23        INC  HL
40C8            7E        LD   A,(HL)
40C9            328540    LD   (1STDIM),A
40CC            23        INC  HL
40CD            7E        LD   A,(HL)
40CE            A7        AND  A
40CF            20F1      JR   NZ,40C2,ERROR
40D1            23        INC  HL
40D2            7E        LD   A,(HL)
40D3            328640    LD   (2NDDIM),A
40D6            23        INC  HL
40D7            7E        LD   A,(HL)
40D8            A7        AND  A
40D9            20E7      JR   NZ,40C2,ERROR
40DB            23        INC  HL
40DC            228840    LD   (STRST),HL
40DF  SORT      DDE5      PUSH IX
40E1            FDE5      PUSH IY
40E3  START     0602      LD   B,02H
40E5            DD2A8840  LD   IX,(STRST)
40E9            DDE5      PUSH IX
40EB            ED5B8640  LD   DE,(2NDDIM)
40EF            1600      LD   D,00H
40F1            DD19      ADD  IX,DE
40F3            DDE5      PUSH IX
40F5            FDE1      POP  IY
40F7            DDE1      POP  IX
40F9            7A        LD   A,D
40FA            218740    LD   HL,4087H,FLAGS
40FD            77        LD   (HL),A
40FE  CHAR1     0E01      LD   C,01H
4100  GETCHAR   FD7E00    LD   A,(IY+0)
4103            DDBE00    CP   (IX+0)
4106            3842      JR   C,414A,EXCHANGE
4108            2017      JR   NZ,4121,NEXTSTR
410A  EQUAL     3A8640    LD   A,(2NDDIM)
410D            B9        CP   C
410E            2811      JR   Z,4121,NEXTSTR
4110            CB4E      BIT  1,(HL)
4112            2006      JR   NZ,411A,CONT
4114            CBCE      SET  1,(HL)
4116            DDE5      PUSH IX
4118            FDE5      PUSH IY
411A  CONT      0C        INC  C
411B            DD23      INC  IX
411D            FD23      INC  IY
411F            18DF      JR   4100,GETCHAR
4121  NEXTSTR   CB4E      BIT  1,(HL)
4123            2806      JR   Z,412B,TESTLAST
4125            CB8E      RES  1,(HL)
4127            FDE1      POP  IY
4129            DDE1      POP  IX
412B  TESTLAST  3A8540    LD   A,(1STDIM)
412E            B8        CP   B
412F            280D      JR   Z,413E,LAST
4131  NOTLAST   3A8640    LD   A,(2NDDIM)
4134  NEXTADDR  DD23      INC  IX
4136            FD23      INC  IY
4138            3D        DEC  A
4139            20F9      JR   NZ,4134,NEXTADDR
413B            04        INC  B
413C            18C0      JR   40FE,CHAR1
413E  LAST      CB46      BIT  0,(HL)
4140            20A1      JR   NZ,40E3,START
4142  FINISH    FDE1      POP  IY
4144            DDE1      POP  IX
4146            CD2B0F    CALL 0F2B,SLOW
4149            C9        RET
414A  EXCHANGE  DD228A40  LD   (TEMPIX),IX
414E            FD228C40  LD   (TEMPIY),IY
4152            CB4E      BIT  1,(HL)
4154            2808      JR   Z,415E,CONT2
4156            FDE1      POP  IY
4158            DDE1      POP  IX
415A            DDE5      PUSH IX
415C            FDE5      PUSH IY
415E  CONT2     ED5B8640  LD   DE,(2NDDIM)
4162  EXCH      DD7E00    LD   A,(IX+0)
4165            F5        PUSH AF
4166            FD7E00    LD   A,(IY+0)
4169            DD7700    LD   (IX+0),A
416C            F1        POP  AF
416D            FD7700    LD   (IY+0),A
4170            DD23      INC  IX
4172            FD23      INC  IY
4174            1D        DEC  E
4175            20EB      JR   NZ,4162,EXCH
4177            DD2A8A40  LD   IX,(TEMPIX)
417B            FD2A8C40  LD   IY,(TEMPIY)
417F            CBC6      SET  0,(HL)
4181            189E      JR   4121,NEXTSTR
```

(continued from previous page)

0's. Note that this will severely limit available memory on 1K ZX-81s. When running programme 1, enter the code in hexadecimal, either as a single byte plus Newline — for example 76 N/L — or as a block at a time — for example 76760000 N/L.

Make sure each byte consists of two digits — for example 00 and not 0. On completion of loading the machine code, enter S plus N/L. Delete lines 10 to 90. Do as a direct command Poke 16510,0. This changes the Rem line number from 1 to 0 and will thus prevent deletion of this line. Now, as a direct command, do a Clear. This will clear the variables area. Now Save on tape and, to be on the safe side, do a backup copy.

How is the program used? Program 2 is useful in that not only does it illustrate the implementation of sort, but also it can be used to ascertain the sort speed under various conditions. It asks how many strings are required to be sorted — I — of what length — J — and how many different letters in the alphabet are to be contained within the strings.

The requisite number of strings are then randomly made up from the number of letters chosen. The programme then Stops itself with report 9/290. If a report of 4/170 is received, the ZX-81 has tried to create an array which was too big for the memory available — reduce the size of I and/or J to compensate. The Stop is there to enable timing of the sort; press Cont then Newline and a stopwatch at the same time. As soon as a display starts to appear, stop the watch. The speed of the sort has now been timed. The critical line is 300 — this is where the sort routine is entered.

Program 1.

```
1 REM (fill this with 256 characters)
10 LET X=16514
20 LETA$=""
30 IF A$="" THEN INPUT A$
40 IF A$="S" THEN STOP
50 POKE X,16*CODE A$+CODE A$(2)-476
60 PRINT AT 11,7;X;" ",A$(1 TO 2)
70 LET X=X+1
80 LET A$=A$(3 TO)
90 GOTO 30
RUN (in FAST)
```

Obviously, to use the sort in a Basic programme, the Rem line with the machine code must be Loaded from tape first. If any null strings are within the array to be sorted, that it those that have been Dimed but have not been defined with characters, these will appear at the beginning of the sorted list — actually these will be filled with Char 0 or spaces. To avoid this, do not Dimension the array more than is going to be used.

Program 2.

```
0 REM ...the machine code sort programme (250 bytes)
100 CLS
110 PRINT "HOW MANY STRINGS REQUIRED ";
120 INPUT I
130 PRINT I
140 PRINT "LENGTH OF EACH STRING ";
150 INPUT J
160 PRINT J
170 DIM A$(I,J)
180 PRINT "HOW MANY DIFFERENT LETTERS REQUIRED ";
190 INPUT D
200 IF D>26 THEN GOTO 190
210 PRINT D
220 FAST
230 FOR N=1 TO I
240 FOR L=1 TO J
250 LET A$(N,L)=CHR$ INT (D*RND+38)
260 NEXT L
270 NEXT N
280 SLOW
290 STOP
300 RAND USR 16528+LEN A$(1)
310 FOR N=1 TO I
320 IF PEEK 16442<=2 THEN SCROLL
330 PRINT A$(N)
340 NEXT N
```

To increase the speed of the sort, Dimension the string array as early in the Basic programme as possible. This will reduce the time taken to find the relevant string in the VARS area. Note the sort returns in Slow mode. If an array has been defined, the format Rand USR 16528 + LEN A$(1) can be used as a direct command, as well as in a Basic programme.

During the running of sort, two types of error could occur:

2:— no such string array exists (standard Sinclair definition)

E:— relevant array has more than 2 dimensions, or at least 1 dimension >255

Using the example program, table 1 was created. This indicates average times of the sort under different conditions.

The timings very clearly show the huge advantage of the machine-code version. Where a dash occurs, no timings were done due to their inevitable extreme length — hours in some cases! Even in machine code, the influence of number of, length and contents of strings is clearly seen.

Users of old Sinclair ROMs note the following changes to the machine-code listing:

4090-4092	CD200F
40A8-40AA	CD280F
40C2-40C4	CD280F
4146-4148	CD280F

SAS ASSAULT

As an SAS officer you must fight to the death in defence of your stronghold in P. Brabbins game for the Vic-20.

SAS ASSAULT IS DESIGNED to work on an unexpanded Vic-20. It uses a short machine-code routine and high-resolution graphics.

As a soldier it is your duty to defend your stronghold until death. While you are guarding the wall, the enemy attacks. You alone have to defend the wall. Your only weapons are some large rocks which you hurl down on to them.

The longer you survive the more adversaries join in and you slow down as you start to tire. You receive three points for every second you survive and bonus points for each adversary you hit. You cannot drop a rock on an enemy soldier who is holding on to the top of the wall or on one who is walking along it. You control your man with keys:

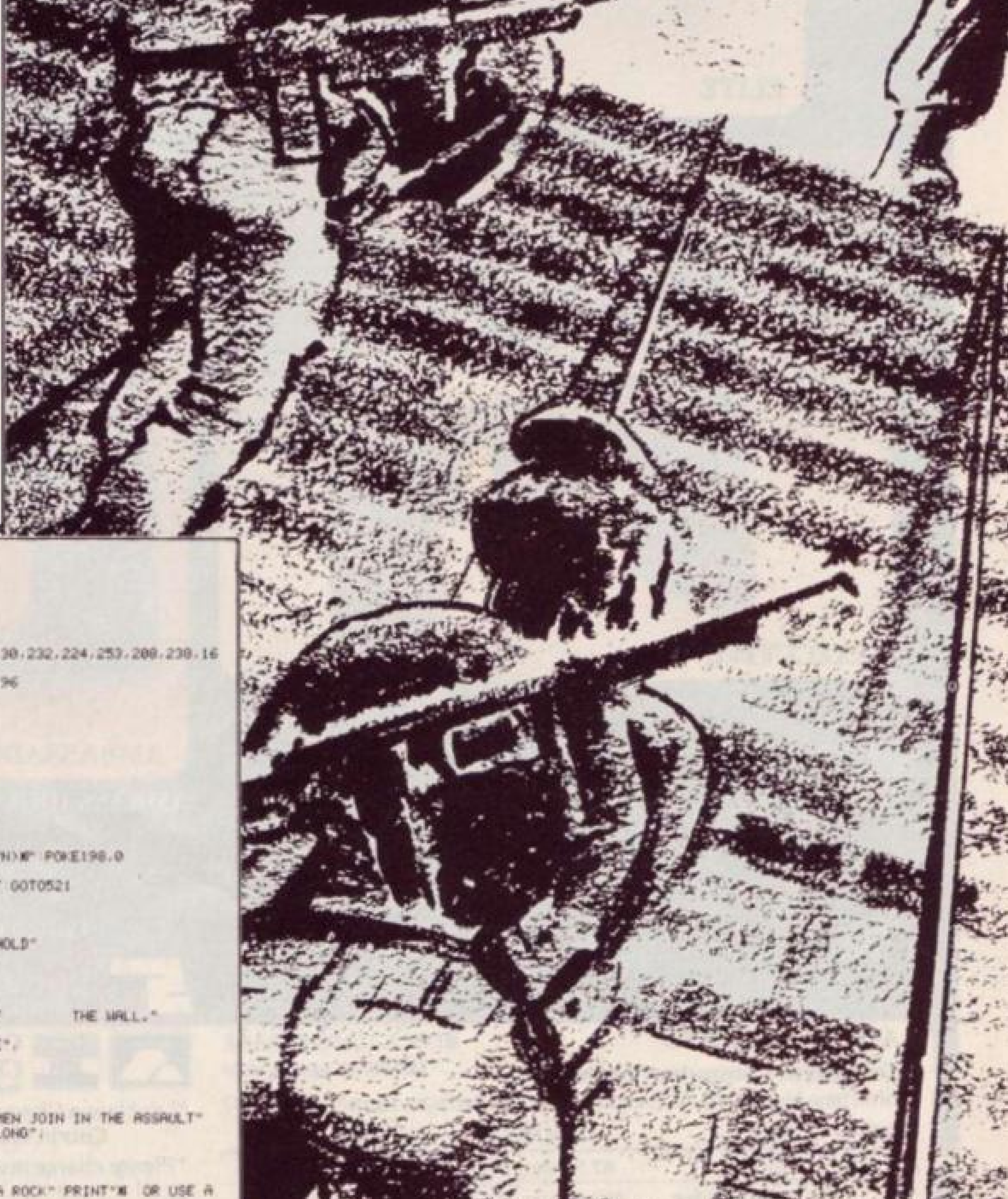
Z — Left   C — Right
F1 — Drop a rock

The program also lets you use a joystick.

The high-resolution graphics and machine code are Poked into memory in program 1 which is also where the instructions are situated. The rest of the program comes in program 2. Type in program 1 and Save it on tape. New the memory and then type in program 2. Save this after program 1 and then it is ready to re-load program 1. After running, program 2 Loads and Runs automatically. The machine code only sets up the screen.

If the game is left as it is, you probably will not get past level 8. To make it easier change line 860 to:

```
FW = INT ((A + 7)/4):IFT = FW OR T = FW*2 OR
   T = FW*3 OR T = FW*4 THEN GOSUB 996
```

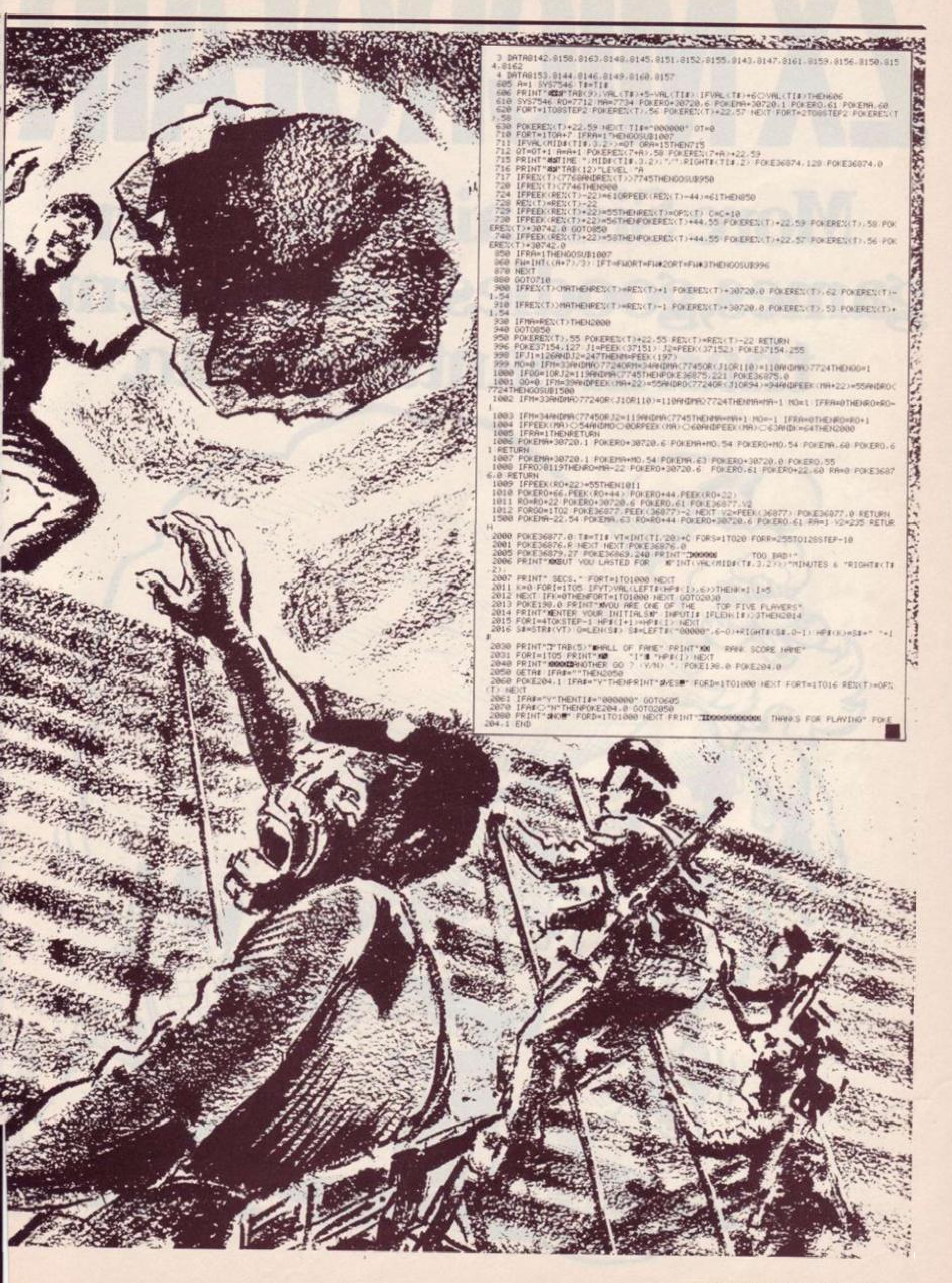


Program 1.

```
1 REM FOR "#" READ HASH CHARACTER
2 POKE56,29:POKE55,122:POKE52,29:POKE51,122
5 LO=7546
10 READP:IFP<>-1THENPOKELO,P:LO=LO+1:GOTO10
20 DATA169,255,141,5,144,169,232,141,15,144
30 DATA162,0,169,0,157,0,150,157,253,150,169,54,157,0,30,232,224,253,208,230,16
2,0
40 DATA169,55,157,66,30,157,30,31,232,224,220,208,243,96
45 DATA0,28,28,64,62,142,126,14
50 DATA0,0,0,0,0,0,0,0
60 DATA255,128,128,128,255,8,8,8
70 DATA2,58,58,2,124,184,184,184
80 DATA56,36,36,36,38,32,96,0
90 DATA64,92,92,64,62,29,29,29
100 DATA28,36,36,36,100,4,6,0
110 DATA66,90,90,66,126,126,24,24
120 DATA0,0,16,28,60,60,126,62
130 DATA0,56,56,2,124,113,126,112
140 DATA0,24,24,0,126,126,90,90,-1
210 POKE36879,27:PRINT"■■■■■■■■■■■■ INSTRUCTIONS ? (Y/N)■":POKE198,0
220 GETA$:IFA$=""THEN220
230 IFA$="N"THENPRINT"                ■NO":FORD=1TO1000:NEXT:GOTO521
240 IFA$<>"Y"THEN220
250 PRINT"             ■YES":FORD=1TO1000:NEXT
500 PRINT"■        ASSAULT■■■■■■■■"
501 PRINT"■YOU HAVE BEEN LEFT IN  CONTROL OF A STRONGHOLD"
502 PRINT"ON THE SCOTTISH BORDER WHILE YOUR COMRADES"
503 PRINT"        ARE AWAY."
504 PRINT"   YOU ARE SUDDENLY       ATTACKED BY        "
505 PRINT" A SAS UNIT. AND YOU ALONE HAVE TO STOP";
506 PRINT"     THE SAS MEN FROM      REACHING THE TOP OF          THE WALL."
507 PRINT"  YOUR ONLY MEANS OF    DEFENCE IS TO THROW"
508 PRINT" LARGE ROCKS ONTO THE MEN   SO THAT THEY ARE";
509 PRINT" KNOCKED DOWN TO THE    BOTTOM OF THE WALL."
510 PRINT"■     PRESS ANY KEY■":POKE198,0
511 GETA$:IFA$=""THEN511
512 PRINT"■        ASSAULT■■■■■■■■"
513 PRINT"■      AS THE GAME       PROGRESSES.MORE SAS MEN JOIN IN THE ASSAULT"
514 PRINT" IF A SAS MAN REACHES THETOP,HE WILL WALK ALONG";
515 PRINT"THE WALL AND KILL YOU.  AT THIS POINT,THE"
516 PRINT" GAME ENDS. AND YOUR   TIME WILL BE GIVEN."
517 PRINT"■ TO CONTROL YOUR MAN.        USE KEYS   "
518 PRINT"■ Z - LEFT   C - RIGHT":PRINT"■  F1 - DROP A ROCK":PRINT"■  OR USE A
JOYSTICK"
519 PRINT"■     PRESS ANY KEY■":POKE198,0
520 GETA$:IFA$=""THEN520
521 PRINT"■        ASSAULT■■■■■■■■          ■":POKE198,7:POKE631,31:POKE632,76:POK
E633,207
522 POKE634,13:POKE635,82:POKE636,213:POKE637,13:END
```

Program 2.

```
1 DIMRE%(22):DIMOP%(22):DIMHP$(5):FORT=1TO5:HP$(T)="00000 ???":NEXT:TI$="000000
":C=0
2 FORT=1TO22:READA:RE%(T)=A:OP%(T)=A:NEXT:FA=0:POKE36878,15
```



```
 3 DATA8142,8158,8163,8148,8145,8151,8152,8155,8143,8147,8161,8159,8156,8150,815
4,8162
 4 DATA8153,8144,8146,8149,8160,8157
 605 A=1:SYS7546:T$=TI$
 606 PRINT"TAB(9);VAL(T$)+5-VAL(TI$):IFVAL(T$)+6<>VAL(TI$)THEN606
 610 SYS7546:RO=7712:MA=7734:POKERO+30720,6:POKEMA+30720,1:POKERO,61:POKEMA,60
 620 FORT=1TO8STEP2:POKERE%(T),56:POKERE%(T)+22,57:NEXT:FORT=2TO8STEP2:POKERE%(T
),58
 630 POKERE%(T)+22,59:NEXT:TI$="000000":QT=0
 710 FORT=1TOA+7:IFRA=1THENGOSUB1007
 711 IFVAL(MID$(TI$,3,2))=QT ORA=15THEN715
 712 QT=QT+1:A=A+1:POKERE%(7+A),58:POKERE%(7+A)+22,59
 715 PRINT"TIME ";MID$(TI$,3,2);"/";RIGHT$(TI$,2):POKE36874,120:POKE36874,0
 716 PRINT"TAB(12)"LEVEL "A
 717 IFRE%(T)<7768ANDRE%(T)>7745THENGOSUB950
 720 IFRE%(T)<7746THEN900
 724 IFPEEK(RE%(T)-22)=61ORPEEK(RE%(T)-44)=61THEN850
 728 RE%(T)=RE%(T)-22
 729 IFPEEK(RE%(T)+22)=55THENRE%(T)=OP%(T):C=C+10
 730 IFPEEK(RE%(T)+22)=56THENPOKERE%(T)+44,55:POKERE%(T)+22,59:POKERE%(T),58:POK
ERE%(T)+30742,0:GOTO850
 740 IFPEEK(RE%(T)+22)=58THENPOKERE%(T)+44,55:POKERE%(T)+22,57:POKERE%(T),56:POK
ERE%(T)+30742,0
 850 IFRA=1THENGOSUB1007
 860 FW=INT((A+7)/3):IFT=FWORT=FW*2ORT=FW*3THENGOSUB996
 870 NEXT
 880 GOTO710
 900 IFRE%(T)<MATHENRE%(T)=RE%(T)+1:POKERE%(T)+30720,0:POKERE%(T),62:POKERE%(T)-
1,54
 910 IFRE%(T)>MATHENRE%(T)=RE%(T)-1:POKERE%(T)+30720,0:POKERE%(T),53:POKERE%(T)+
1,54
 930 IFMA=RE%(T)THEN2000
 940 GOTO850
 950 POKERE%(T),55:POKERE%(T)+22,55:RE%(T)=RE%(T)-22:RETURN
 996 POKE37154,127:J1=PEEK(37151):J2=PEEK(37152):POKE37154,255
 998 IFJ1=126ANDJ2=247THENM=PEEK(197)
 999 MO=0:IFM=33ANDMA>7724ORM=34ANDMA<7745OR(J1OR110)=110ANDMA>7724THENOO=1
 1000 IFOO=1ORJ2=119ANDMA<7745THENPOKE36875,221:POKE36875,0
 1001 OO=0:IFM=39ANDPEEK(MA+22)=55ANDRO<7724OR(J1OR94)=94ANDPEEK(MA+22)=55ANDRO<
7724THENGOSUB1500
 1002 IFM=33ANDMA>7724OR(J1OR110)=110ANDMA>7724THENMA=MA-1:MO=1:IFRA=0THENRO=RO-
1
 1003 IFM=34ANDMA<7745ORJ2=119ANDMA<7745THENMA=MA+1:MO=-1:IFRA=0THENRO=RO+1
 1004 IFPEEK(MA)<>54ANDMO<>0ORPEEK(MA)<>60ANDPEEK(MA)<>63ANDK=64THEN2000
 1005 IFRA=1THENRETURN
 1006 POKEMA+30720,1:POKERO+30720,6:POKEMA+MO,54:POKERO+MO,54:POKEMA,60:POKERO,6
1:RETURN
 1007 POKEMA+30720,1:POKEMA+MO,54:POKEMA,63:POKERO+30720,0:POKERO,55
 1008 IFRO>8119THENRO=MA-22:POKERO+30720,6: POKERO,61:POKERO+22,60:RA=0:POKE3687
6,0:RETURN
 1009 IFPEEK(RO+22)=55THEN1011
 1010 POKERO+66,PEEK(RO+44):POKERO+44,PEEK(RO+22)
 1011 RO=RO+22:POKERO+30720,6:POKERO,61:POKE36877,V2
 1012 FORGO=1TO2:POKE36877,PEEK(36877)-2:NEXT:V2=PEEK(36877):POKE36877,0:RETURN
 1500 POKEMA-22,54:POKEMA,63:RO=RO+44:POKERO+30720,6:POKERO,61:RA=1:V2=235:RETUR
N
 2000 POKE36877,0:T$=TI$:VT=INT(TI/20)+C:FORS=1TO20:FORR=255TO128STEP-10
 2001 POKE36876,R:NEXT:NEXT:POKE36876,0
 2005 POKE36879,27:POKE36869,240:PRINT"        TOO BAD!"
 2006 PRINT"BUT YOU LASTED FOR   "INT(VAL(MID$(T$,3,2)))"MINUTES & "RIGHT$(T$
,2);
 2007 PRINT" SECS.":FORT=1TO1000:NEXT
 2011 K=0:FORI=1TO5:IFVT>VAL(LEFT$(HP$(I),6))THENK=I:I=5
 2012 NEXT:IFK=0THENFORT=1TO1000:NEXT:GOTO2030
 2013 POKE198,0:PRINT"YOU ARE ONE OF THE    TOP FIVE PLAYERS"
 2014 PRINT"ENTER YOUR INITIALS":INPUTI$:IFLEN(I$)>3THEN2014
 2015 FORI=4TOKSTEP-1:HP$(I+1)=HP$(I):NEXT
 2016 S$=STR$(VT):O=LEN(S$):S$=LEFT$("00000",6-O)+RIGHT$(S$,O-1):HP$(K)=S$+"  "+I
$
 2030 PRINT"TAB(5)"HALL OF FAME":PRINT"   RANK SCORE NAME"
 2031 FORI=1TO5:PRINT"    "I"  "HP$(I):NEXT
 2040 PRINT"ANOTHER GO ? (Y/N) ";:POKE198,0:POKE204,0
 2050 GETA$:IFA$=""THEN2050
 2060 POKE204,1:IFA$="Y"THENPRINT"YES":FORD=1TO1000:NEXT:FORT=1TO16:RE%(T)=OP%
(T):NEXT
 2061 IFA$="Y"THENTI$="000000":GOTO605
 2070 IFA$<>"N"THENPOKE204,0:GOTO2050
 2080 PRINT"NO":FORD=1TO1000:NEXT:PRINT"   THANKS FOR PLAYING":POKE
204,1:END
```

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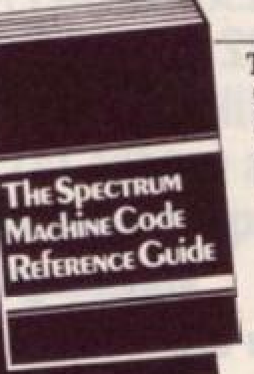
This 315-page book is designed to teach you the essential elements of programming in machine code. Written by Toni Baker, author of the highly successful 'Mastering Machine Code on the ZX81', this new book assumes absolutely no previous knowledge of machine code whatsoever, and yet promises to take you to a level of proficiency beyond your wildest dreams. Starting with simple addition and subtraction you'll be slowly guided through the entire subject of machine code. The book explores and utilises the incredible speed of machine code, giving you real time graphics games like BREAKOUT and leads you up to a full working DRAUGHTS program. Among other useful skills you'll acquire the ability to create music in real time (impossible in BASIC) and to plot in high-resolution graphics faster than you would have believed possible.

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Richard Ross-Langley £4.95

This 170-page reference work for Spectrum machine code programmers contains a full disassembly of the Spectrum ROM, with details of the Microdrive and Interface 1. Features of the disassembler include: Zilog mnemonics are used, eg LD A, (HL) instead of MOV A, M; relative jumps show the signed decimal offset and the result; hex values are default and are printed without suffix; decimal values are preceded by a plus or minus sign; and some restart instructions are followed by data bytes. The absolute addresses of all system variables and several important routines have been named, using where possible the standard names shown in the manual. The chapter headings in the Microdrive/Interface 1 section of the book include the RS232 Interface; Microdrive Channel data; Local Area Network; Network Algorithms; System Variables; and a summary of functions. **This book is a must reference work for serious Spectrum machine code programmers.**

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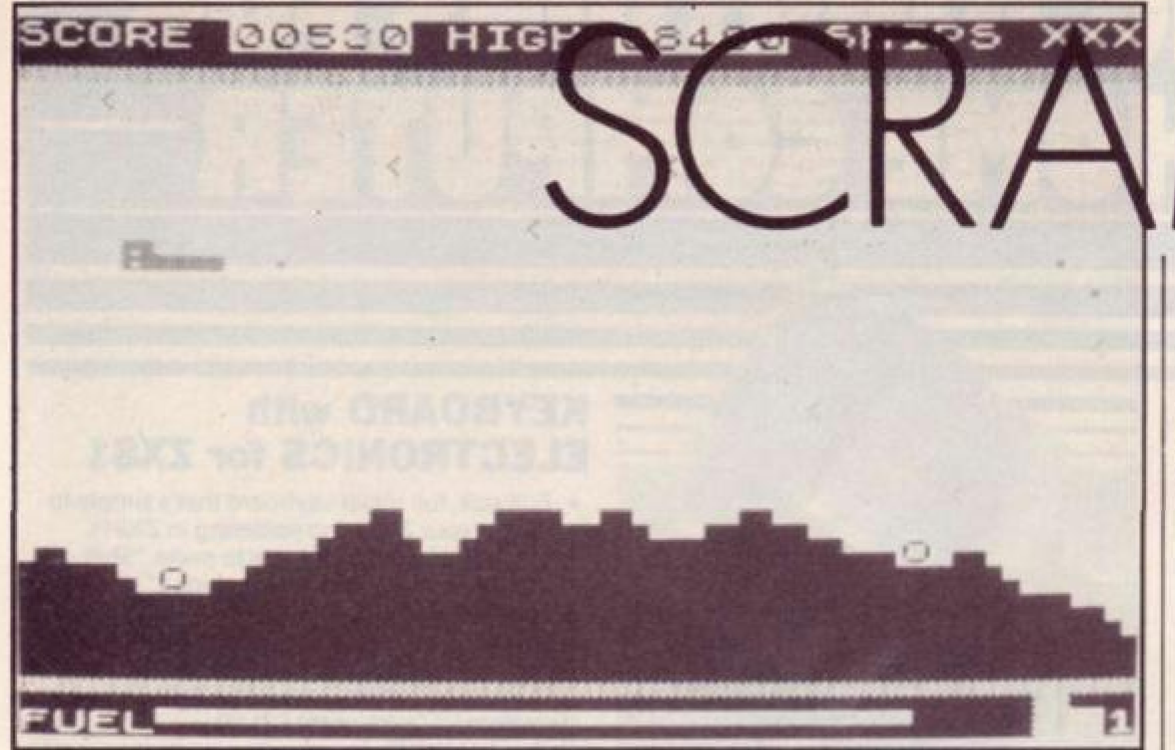
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SCRAM-81

ZX-81

Philip Harwood completes his Scramble-type game for the ZX-81 with details of aircraft movement and firing systems.

WE NOW MOVE INTO part two of the program for Scram-81. This is where the aircraft and other features of the game are added. Reserve more space for the machine code by creating Rem statements 14 to 18 of lengths indicated in table 1. Check the addresses as before.

The aircraft and bombs etc. are held on a separate screen which is superimposed onto the background and erased just before the background is moved. The time of erasure is kept to an absolute minimum to avoid any excess flickering of the screen. Enter the machine code for Rem 14. This deals with the movement of the aircraft.

In addition to the last Basic program, add or change the following:

```
131 LET F = 20499
132 FOR G = 1 TO 6
133 POKE F,22
134 POKE F + 1,3
135 POKE F + 2,0
136 LET F = F + 3
137 NEXT G
138 POKE 20488,185
139 POKE 20489,2
141 POKE 20480,0
142 POKE 20486,21
143 POKE 20487,3
155 RAND USR 21331
170 RAND USR 21355
180 IF PEEK 20480 = 0 THEN GOTO 155
```

The aircraft should now appear and is controlled by the keys A — up, Z — back and M — forward. Note that two keys can be pressed simultaneously to give diagonal movement. There is a limit to how far the aircraft can move forward, this can be adjusted by Poking address 21506.

Rem 15 contains seven subroutines:

(continued on page 193)

Rem 14.

```
21331 - 110A500609C51A4F = 424
21339 - 131A47132A0C40ED = 490
21347 - 4A36001 3C110EEC9 = 795
21355 - CD8802CB4DCCA853 = 1132
21363 - CB45CCC953CB7D20 = 1120
21371 - 0ACB64CCE553CB5C = 1124
21379 - CCFE53CD1754ED5B = 1181
21387 - 08502A0C4019368E = 427
21395 - 23368A233683210A = 490
21403 - 50ED5B0850060373 = 620
21411 - 237223231310F8C9 = 703
21419 - 3A0650FE02C8E521 = 862
21427 - 0650352A08501121 = 319
21435 - 00A7ED527D320850 = 749
21443 - 7C320950E1C93A06 = 753
21451 - 50FE15C8E5210650 = 903
21459 - 342A085011210019 = 257
21467 - 7D3208507C320950 = 526
21475 - E1C93A0750FE00C8 = 1025
21483 - E52107503S2A0850 = 532
21491 - 2B7D3208507C3209 = 489
21499 - 50E1C93A0750FE10 = 921
21507 - C8E52107503 42A08 = 651
21515 - 50237D3208507C32 = 552
21523 - 0950E1C92A0C40ED = 870
21531 - 5B0850190 6037EFE = 593
21539 - 0028053E01320050 = 238
21547 - 2310F3C9 = 495
```

Rem 15.

```
21557 - 3A0150472A0C4011 = 348
21565 - 0A00197E3CFE2620 = 545
21573 - 063E1C772B18F477 = 645
21581 - 10EAC93A02502142 = 690
21589 - 50882804232310F9 = 657
21597 - 237E320150C92108 = 531
21605 - 5035C02A0C40ED5B = 771
21613 - 0350197EFE032004 = 655
21621 - 3601180DFE012004 = 639
21629 - 3600180518ED5303 = 561
21637 - 503E05320550C93E = 545
21645 - 05320550ED5B0350 = 551
21653 - 2A0C401906033663 = 337
21661 - 23137EFE08280710 = 633
21669 - F5ED530350C918ED = 1113
21677 - 530350C90614C52A = 632
21685 - 0C40110502191121 = 383
21693 - 000E130620A7ED52 = 557
21701 - 7E19772B10F72B0C = 632
21709 - 20F1062036002B10 = 424
21717 - FBC110DAC90632C8 = 1132
21725 - 2A0C400E18062023 = 229
21733 - 7EC6807710F9230D = 884
21741 - 20F3C110EAC90E02 = 935
21749 - 060A2A0C40117501 = 269
21757 - 19112100C53AF354 = 687
21765 - 473AF4544F3E8077 = 848
21773 - 2310FC2877190D20 = 535
21781 - FBA7ED52F53AF354 = 1367
21789 - 473AF4544FF17728 = 939
21797 - 10FC2377A7ED5200 = 921
21805 - 20F92BEE21F35434 = 965
21813 - 34233434E1C1D511 = 839
21821 - 00021D20FD1520FA = 619
21829 - D1108921F354360E = 838
21837 - 233602C93E0A3208 = 428
21845 - 55F5CDF554F130FE = 1420
21853 - FF20F3C9 = 731
```

Rem 16.

```
21863 - C5D5FE97CAA155FE = 1517
21871 - 1CCAA155FE36CAA1 = 1147
21879 - 55FE34CAAF55FE0D = 1120
21887 - CABA55FE9CCAC555 = 1357
21895 - FEB4CAC555FE26CA = 1412
21903 - D055D1183E161213 = 650
21911 - 3E0312133E00121B = 209
21919 - C1C9320250360OCD = 785
21927 - 5054CD3554C39155 = 931
21935 - 320250360OCD8C54 = 615
21943 - C3A6553202503E01 = 641
21951 - 32FD4FC3A4553600 = 880
21959 - 112100A7ED52C3A1 = 892
21967 - 553600112100197E = 340
21975 - C3A155CD8802CB75 = 1155
21983 - 202106042115507E = 335
21991 - FE0028072323231 0 = 422
21999 - F61810361B282B3A = 511
22007 - 10505F3A11505713 = 452
22015 - 7323721115500604 = 392
22023 - 1AFE0028221B1BC5 = 605
22031 - 1A4F131A472A0C40 = 339
22039 - 091B037912137812 = 335
22047 - C17EFE00200F237E = 781
22055 - FE002009361B1313 = 414
22063 - 131310D4C9CD6755 = 860
22071 - C32D56CD8802CB5D = 1016
22079 - 202506022121507E = 349
22087 - FE00280723232310 = 422
22095 - F61814361728283A = 511
22103 - 0D505F3A0E505706 = 433
22111 - 211310FD73237211 = 602
22119 - 215006021AFE0028 = 441
22127 - 2E1B1BC51A4F131A = 447
22135 - 472A0C40091BD516 = 460
22143 - 22031520FCD17912 = 690
22151 - 137812C17EFE0020 = 762
22159 - 14D5112200190D17E = 644
22167 - FE00200936171313 = 410
22175 - 131310C8C9CD6755 = 848
22183 - C39D56 = 438
```

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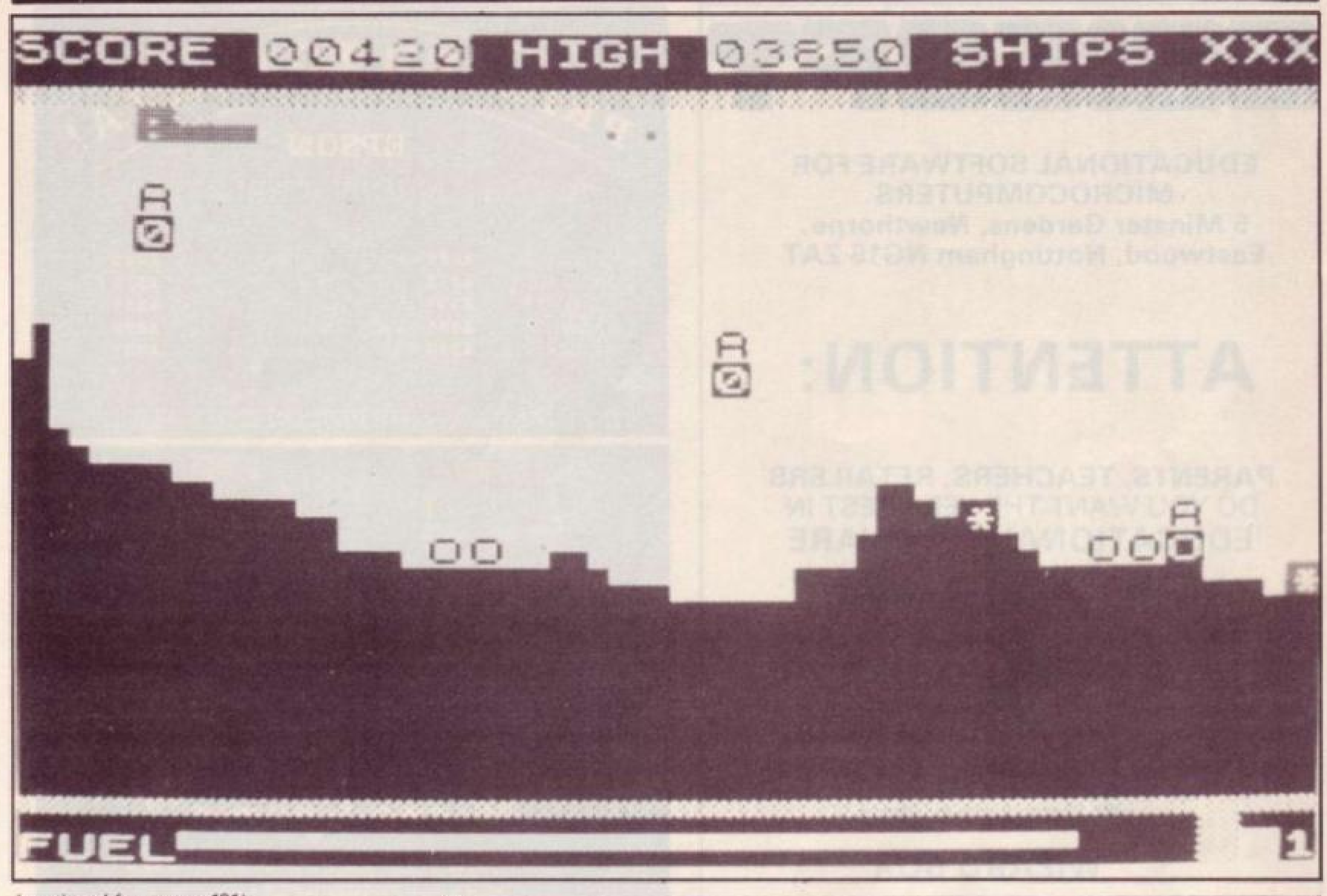
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(continued from page 191)

Screen score	21557-21583.
Score character convert	21584-21602.
Fuel gauge	21603-21643.
Refuelling	21644-21680.
Down scroll	21681-21721.
Crash flash	21722-21746.
Success graphics	21747-21856.

These subroutines cannot be tested properly at the moment but they should be entered just now.

Bombing and firing is held in Rem 16. This should be entered.

Also add:

```
172 RAND USR 21978 — firing
173 RAND USR 22074 — bombing
174 RAND USR 21603 — fuel gauge
```

Keys 1 to 5 operate the bombs and Return fires the bullets. There is a maximum of two bombs and four bullets. Before Running — 100 — add the following lines in Basic:

```
151 PRINT AT 0,0; "SCORE 00000"
152 POKE 16418,0
153 PRINT AT 23,0; "FUEL (25 x graphic 6) graphic H"
```

Enter Rems 17 and 18. These are the two main reset/controller programs. If the machine code has been entered correctly type:

```
RAND USR 22411
```

and the complete game should Run. To break into it, press the zero key. If it works, then congratulations, if not then check the machine code for part two. If you wish to add a title page then Poke addresses 22801 and 22775 with 201. This will let the program return to Basic at the end of every game where a title page in Basic can be added.

To complete the program, delete all the Basic except the initial Rem statements and add:

```
50-100 title page (if desired)
150 RAND USR 22411
160 GOTO 50.
```

If anyone does not wish to attempt the task of entering this large machine-code program or has problems in getting it to Run properly then a cassette version is available by writing direct to the author; P. Harwood, 12 Upper Glen Road, Bridge of Allan, Nr Stirling. Price £3.50 inc. p&p. ■

Table 1.

Rem	Length	Start address	End address	Type	Purpose
14	220	21331	21550	mc	Move the aircraft.
15	300	21557	21856	mc	Subroutines.
16	323	21863	22185	mc	Bombing and Firing.
17	213	22192	22404	mc	Reset subroutines.
18	393	22411	22803	mc	Drive/controller program.

Rem 17.

```
22192 - D11A13D5FEFFC877 = 1295
22200 - 2318F52A0C401122 = 473
22208 - 0019062036892310 = 305
22216 - FBC92A0C4011FC02 = 841
22224 - 190619368832310FB = 543
22232 - C92A0C4023CD8056 = 821
22240 - B8A8B4B7AA801C1C = 1069
22248 - 1C1C1C80ADAEACAD = 904
22256 - 801C1C1C1C1C8088 = 580
22264 - ADAEB588808D8D8D = 1407
22272 - FFCD8B562A0C4011 = 868
22280 - D702190620368A23 = 507
22288 - 10FB2B2B2B368823 = 621
22296 - 232323CD8056ABBA = 929
22304 - AAB1FFCDCA563688 = 1285
22312 - 2323369D21FC4F36 = 699
22320 - 0123233603233600 = 217
22328 - 218D543605210557 = 650
22336 - 3610C921FA4F3600 = 687
22344 - 2336002335233600 = 266
22352 - 2323233600232323 = 264
22360 - 3614233603233605 = 260
22368 - 2336152336032336 = 291
22376 - 8923360221135006 = 414
22384 - 0636162336032336 = 263
22392 - 002310F5CDCA5621 = 822
22400 - 9857366BC9 = 604
```

Rem 18.

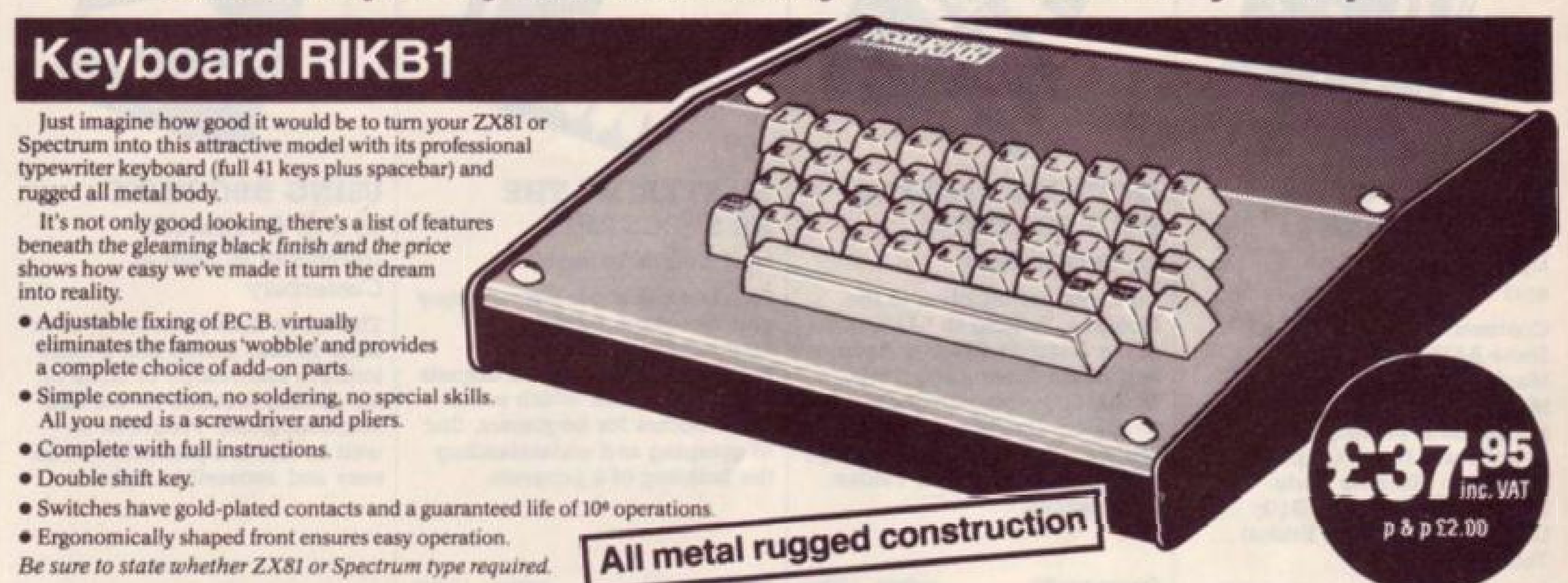
```
22411 - CD0956CD4357CD53 = 1155
22419 - 53CD585221FEFDCD = 1203
22427 - 6B53CDDA55CD3A56 = 1047
22435 - CD63543E01320150 = 582
22443 - CD35543A0050FE01 = 735
22451 - CA23583AFD4FFE01 = 970
22459 - CA41583A0350FEFC = 1002
22467 - CC01582A0C401107 = 435
22475 - 00197EFE1DCCE857 = 957
22483 - 11FF101D20FD1520 = 655
22491 - FACD8856CD8802CB = 1325
22499 - 65C8C3915721FF4F = 1095
22507 - 7EFE01C836012834 = 731
22515 - 462A0C4011210019 = 263
22523 - 2810FD368DC92A0C = 810
22531 - 401103030319CD8056 = 579
22539 - 343A39003428002B = 305
22547 - 3A2A31FF219B5736 = 733
22555 - 6E002105503680C9 = 611
22563 - CDDA54CD815421FE = 1260
22571 - 4F35CAC258462A0C = 740
22579 - 401121001928100FD = 451
22587 - 283680C38E57CD51 = 935
22595 - 55CD81542A0C4011 = 686
22603 - 17031934218D5436 = 415
22611 - 04210557352A0C40 = 508
22619 - 11110119CD805628 = 567
22627 - 34332C3726393A31 = 404
22635 - 26392E343338FF11 = 572
22643 - 310019CD8056322E = 637
22651 - 38382E3433000038 = 317
22659 - 3A28282A38382B3A = 393
22667 - 31FF11300019CDB0 = 775
22675 - 561D1C1C1C003534 = 304
22683 - 2E33393800273433 = 352
22691 - 3A38FF3E64320150 = 662
22699 - CD3554110000 1D20 = 420
22707 - FD1520FACD815421 = 1055
22715 - FC4F3601C38E572A = 852
22723 - 0C4011560119CDB0 = 586
22731 - 562C26322A00343B = 371
22739 - 2A37FF1100001D20 = 430
22747 - FD1520FACD81542A = 1054
22755 - 0C40111100019EB2A = 412
22763 - 0C4001060009 1ABE = 308
22771 - 38092803C38B5723 = 564
22779 - 1318F32A0C401106 = 427
22787 - 0019EB21F0560606 = 631
22795 - 1A77231310FAC38B = 799
22803 - 57 = 87
```

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The Newbrain computer is fast becoming one of Britain's most sought after micros.
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0905104 676 approx. £7.50

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0905104 51X approx. £6.95

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Disc drives have been in general use with computer systems for many years but it is only in the last few years that they have become available to the microcomputer user and only now are they becoming available at the right price for home computer users.
One of the main features of the book is a detailed explanation of perhaps the most important of all access methods, the 'Index Sequential Access Method' (ISAM) and a section on how to create your own ISAM for your computer. The book includes a full explanation of record and file design.

October'83 approx. 144pp
0946195 10 2 £6.95

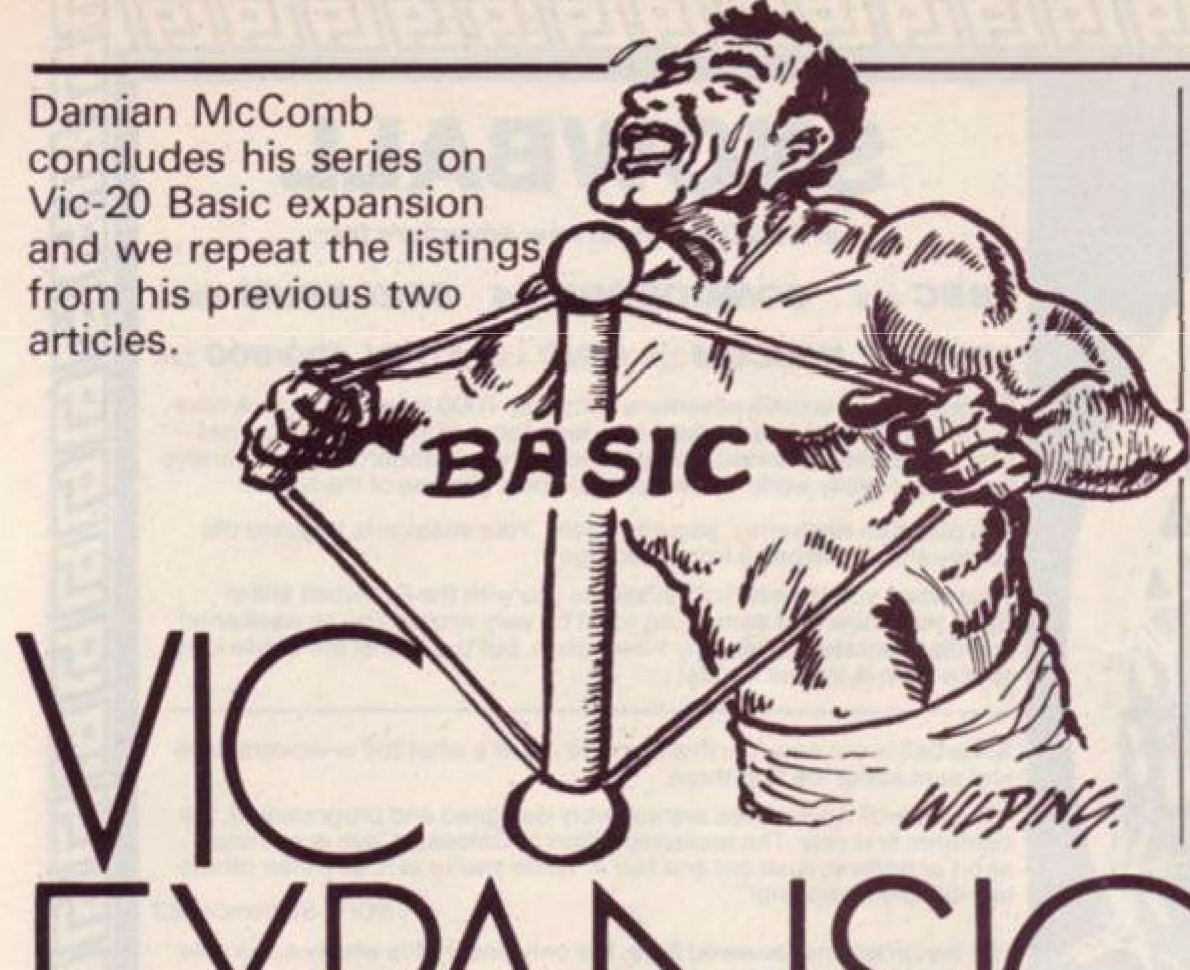
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Damian McComb concludes his series on Vic-20 Basic expansion and we repeat the listings from his previous two articles.



VIC EXPANSION

THIS MONTH is the third and final part of the extended Basic program for the Vic-20 with 3K expansion. Listings from the previous two articles have been included as well as the final part of the program. I must stress that you must use a 3K expansion and no other type since they use different memory blocks. However, if you have an expansion board you may use additional 8K and 16K packs along with the 3K. When you type in and run the three extended Basic programs one after the other, the familiar

CBM BASIC V2

message should appear. You must now type the following command, which protects the program from being overwritten, before anything else:

LOMEM 2830: DOKE 2829,0:NEW

You are now ready to use the new commands. Remaining commands include:

Trace A: Parameters — A = 0, turns trace off; A = 1, turns trace on. This command puts a trace on a Basic program while running. The

(continued on page 199)

Listing 1.

```
FOR "■" READ INVERSE POUND SIGN
 0 POKE56,22:POKE55,7:CLR
 1 POKE36879,238:PRINT"■■■──────────────────":PRINT"■■VIC EXTENDED BASIC"
 2 PRINT"■■──────────":PRINT"■■■■■COPYRIGHT 1983":PRINT"■■■■■■■■■■■■B
Y"
 3 PRINT"■■■■■DAMIAN MC COMB":PRINT"■■■■■■■■PLEASE WAIT..."
 7 REM **
 8 REM ** INITIALISE
 9 REM **
 10 DATA20,46,04,20,1A,04,58,4C,7B,E3,A2,0B,BD,26,04
 20 DATA9D,00,03,CA,10,F7,60
 30 DATA3A,C4,83,C4,79,05,DB,05,0E,06,34,06
 40 DATA2C,11,91,20,34,F7,20,E1,FF,D0,06,20,49,04,6C,02,C0,4C,56,FF
 50 DATA20,6D,EA,20,6D,EA,20,F9,FD,20,18,E5
 60 DATAA9,D2,8D,16,03,A9,FE,8D,17,03,60
 67 REM **
 68 REM ** DISPATCH    68 REM ** LOCATIONS
 69 REM **
 70 DATA89,FF,62,06,AD,06,B2,06,C3,06,D3,06,2E,07,5C,07,63,07,82,07,97,07,AE,07,
D1,07,E6,07
 71 DATA0F,04,33,FD,F9,07,07,08,15,08,2F,08,53,08,63,08,91,08,9E,08,AF,08,D7,08,
F7,08,17,09
 72 DATA3A,09,70,09,B2,09,20,0A,42,0A,59,C3,17,E5,57,0A,83,0A,99,0A
 73 DATAD2,0A,E3,0A,F4,0A,01,0B
 84 DATA END
 87 REM **
 88 REM ** TOKEN TABLE
 89 REM **
 90 DATA52,45,53,55,4D,C5,46,49,4C,CC
 91 DATA43,4C,D3,45,52,D2,57,49,4E,44,4F,D7,53,4F,55,4E,C4
 92 DATA4D,55,53,49,43,A8,49,4E,CB,50,41,50,45,D2,42,44,D2,41,55,D8,52,455,50,45
 41,D4
 93 DATA50,41,55,53,C5,43,55,52,53,45,D4,52,45,53,45,D4,4B,49,4C,CC
 94 DATA4C,4F,4D,45,CD,48,49,4D,45,CD,53,45,54,43,41,53,C5,42,52,45,41,CB
 95 DATA49,52,D1,42,45,45,D0,46,45,54,43,C8,43,4C,C4,43,53,D6,42,4F,4F,CD,5A,41,
D0
 96 DATA50,49,4E,C7,4D,4F,44,C5,52,45,4E,55,4D,42,45,D2,54,52,41,43,C5,44,4F,4B,
C5,50,55,D4
```

(listing 1 continued on page 199)



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SNOWBALL IX
Dealer Enquiries Welcome

(listing 1 continued from page 197)

```
97 DATA42,52,CB,53,45,54,53,43,52,45,45,CE,53,43,52,4F,4C,CC,4D,4F,D4
98 DATA4A,4F,D9,50,45,CE,50,41,C4,4B,45,D9,53,57,49,54,43,C8
110 DATA00,END
117 REM **             117 REM ** VECTORS     117 REM **
118 DATA20,7C,C5,A0,05,B9,FB,01,F0,57,C9,22,F0,47
119 DATAC9,41,90,40,C9,5B,B0,3C
120 DATA84,B1,A2,00,86,0B
130 DATA20,FD,B1,04,F0,13,C9,80,F0,16
140 DATABD,B1,04,F0,27,30,03,E8,D0,F6
150 DATAE6,0B,A4,B1,A9,C8,B9,FB,01,E8,D0,E0
160 DATAA6,B1,A5,0B,18,69,CC,9D,FB,01
170 DATAC8,E8,B9,FB,01,9D,FB,01,D0,F6,A4,B1
180 DATAC8,D0,B0
190 DATAC8,B9,FB,01,F0,06,C9,22,D0,F6,F0,F1,60
200 DATA08,C9,FF,F0,2A,24,0F,30,26,C9,CC,90,22,20
210 DATA38,E9,CB,AA,84,49,A0,FF
220 DATACA,F0,08,C8,B9,B1,04,10,FA,30,F5
230 DATAC8,B9,B1,04,30,05,20,D2,FF,D0,F5
240 DATA4C,EF,C6,20,4C,1A,C7
250 DATA20,73,00,C9,CC,90,19,C9,F1,B0,15,20,1F,06,4C,AE,C7
260 DATAE9,CB,0A,A8,B9,5E,04,48,B9,5D,04,48,4C,73,00
270 DATA20,79,00,4C,E7,C7
280 DATAA9,00,85,0D,20,73,00,C9,F1,90,13,C9,FE,B0,0F,E9,CB
290 DATA0A,A8,B9,5E,04,48,B9,5D,04,48,4C,73,00
300 DATAA5,7A,D0,02,C6,7B,C6,7A,4C,86,CE,20,8A,CD,4C,F7,D7
997 REM
998 REM ** POKE IN
999 REM
1000 FORI=0TO76:READA$:GOSUB10000:POKE5640+I,N:NEXT
1100 I=5717
1110 READA$:IFA$="END"THEN1200
1120 GOSUB10000:POKEI,N:I=I+1:GOTO1110
1200 I=5801
1210 READA$:IFA$="END"THEN1300
1220 GOSUB10000:POKEI,N:I=I+1:GOTO1210
1300 FORI=6001TO6234:READA$:GOSUB10000:POKEI,N:NEXT:GOTO20000
10000 A=ASC(A$)-48:B=ASC(RIGHT$(A$,1))-48:N=B+7*(B>9)+16*(A+7*(A>9)):RETURN
20000 PRINT"■NOW LOAD THE 2ND PART■"
```

current line number is displayed in the top left hand corner of the screen and the program can be paused at any point, to view the line number, by pressing the Ctrl, Shift or Commodore keys.

Doke A, B: Parameters — A (0 to 65535); B (0 to 65535). This command is similar to Poke, only it is used to set words — two bytes of memory at a time instead of single bytes. For example

DOKE 0, 1000

would put 232 in 0, and 3 in 1.

Put A: Parameters — A = ASCII value (0-255) repeatable. This will out a character or group of characters separated by commas to the present output device — usually the screen. For example

PUT 65, 66, 67, 32, 48, 49, 50

will output: ABC 123.

Brk produces a forced break on the Vic-20 which is the same as holding down Run, Stop, and Restore.

Setscreen resets the screen to its default status. That is to say it will reset the Ink, Paper, Bdr, Window and rows and columns of the screen.

Scroll A: Parameters — A = 0 or 1. This scrolls the screen one line up or down — 0 = up, 1 = down.

Mot A: Parameters — A = 0 or 1. This enables and disables the cassette motor — 0 = enable, 1 = disable.

Joy reads the joystick and returns a value according to direction: 0 = no direction; 1 = up; 2 = down; 4 = left, 8 = right; 128 = fire button.

Remember that the fire button can be used with any direction and diagonal directions

(continued on next page)

Listing 2.

```
498 REM FILL
500 DATA20,5D,06,A5,14,85,FA,A5,15,85,FB,20,FD,CE,20,5D,06,A5,14,85,FC,A5,15,85
,FD
510 DATA20,FD,CE,20,9E,D7,8A,A0,00,91,FA,A6,FB,E4,FD,F0,04,B0,11,D0,06,A6,FA,E4
,FC
520 DATAB0,09,E6,FA,D0,EA,E6,FB,18,90,E5,20,79,00,C9,2C,D0,06,20,73,00,18,90,B6
,60
531 REM CLS
540 DATAA9,93,4C,09,E1
551 REM ERR
560 DATA20,9E,D7,E0,00,F0,04,E0,1F,90,03,4C,48,D2,4C,3A,C4
571 REM WINDOW
580 DATA20,9E,D7,8E,00,90,20,FD,CE,20,9E,D7,8E,01,90,60
591 REM SOUND
600 DATA20,9E,D7,E0,04,90,03,4C,48,D2,86,FF,20,FD,CE,20,9E,D7,A9,F0,2D,0E,90,8A
610 DATA0D,0E,90,8D,0E,90,20,FD,CE,20,9E,D7,8A,A6,FF,9D,0A,90,20,FD,CE,20,5D,06
,E6,14,E6,15
620 DATAA0,05,A2,00,CA,D0,FD,88,D0,F8,C6,14,D0,F2,C6,15,D0,EE,A9,00,A6,FF,9D,0A
,90
630 DATA20,79,00,C9,2C,D0,06,20,73,00,18,90,A6,60
640 REM MUSIC<
650 DATAA2,00,8E,00,01,20,9E,D7,A8,8A,AE,00,01,9D,01,01,E8,E0,06,B0,0B,20,73,00
,C0,29
660 DATAF0,07,C0,2C,F0,E2,4C,08,CF,CA,BD,01,01,9D,0A,90,CA,10,F7,60
669 REM INK
670 DATA20,9E,D7,8E,86,02,60
679 REM PAPER
680 DATAA9,0F,85,FF,20,9E,D7,A0,01,8A,0A,0A,0A,0A,AA,A5,FF,39,0E,90,99,0E,90,8A
690 DATA19,0E,90,99,0E,90,60
699 REM BDR
700 DATAAD,0F,90,29,F8,8D,0F,90,20,9E,D7,8A,29,07,0D,0F,90,8D,0F,90,60
709 REM AUX
710 DATA20,9E,D7,AD,0E,90,29,0F,8D,0E,90,8A,0A,0A,0A,0A,0D,0E,90,8D,0E,90,60
719 REM REPEAT
720 DATA20,9E,D7,8A,C9,03,90,03,4C,48,D2,C9,02,F0,0E,C9,01,F0,04,8D,8A,02,60,A9
,40
730 DATA8D,8A,02,60,A9,80,8D,8A,02,60
739 REM PAUSE
740 DATA20,5D,06,E6,14,E6,15,A2,00,CA,D0,FD,C6,14,D0,F7,C6,15,D0,F3,60
749 REM CURSET
750 DATA20,9E,D7,86,FF,20,FD,CE,20,9E,D7,8A,A8,A4,FF,18,4C,F0,FF
759 REM LOMEM
760 DATA20,5D,06,A5,14,85,2B,A5,15,85,2C,4C,64,C6
769 REM HIMEM
770 DATA20,5D,06,A5,14,85,2D,A5,15,85,2E,4C,64,C6
779 REM SETCASE
780 DATA20,9E,D7,E0,02,90,03,4C,48,D2,E0,01,D0,06,A9,80,8D,91,02,60,A9,00,8D,91
,02,60
```

(listing 2 continued on next page)

(continued from previous page)
may be used so combinations of the above values may occur, e.g., up + fire = 129.

Pen A reads the horizontal and vertical components of the light pen. If A=0 the horizontal is read; if A=1 the vertical is read.

Pad reads the paddle controller.

Key reads the keyboard and returns the different value for every key.

Switch returns the status of the cassette switch. 64 means it is off; 0 means it is on.

Because I tried to keep the Basic extension program so short — 1.7K — this has meant a few minor drawbacks . . .

■ Command abbreviation — such as P shift O for Poke — are not available for the new commands.

■ When using the new commands directly after a Then statement you must place a colon. For example

IF X=0 THEN : FILL 768 , 8185, 81

This is the same case for any Basic extension on the Vic including the Super Expander cartridges.

■ Some of the new commands occasionally — in direct-mode only — cause a syntax error even though they are still carried out. Do not worry about this as it does not affect the execution of the commands in any way and it never happens within a program. There are several ways of avoiding the syntax errors, one of which is to type a colon — or two — after the command. For example

RENUMBER 100,20::

One point in favour of the Basic is that all parameters can be constant, variables or calculated using other functions. For example

PAPER 2
INK 4*N+3
WINDOW SIN(J)*10,COS(J/2)*15

If you missed the previous instalments of this series, I have a cassette available containing the extended Basic, demonstration game and a few other demonstration programs along with a reference manual for £5.00.

I also have cassettes of my other two programs published in this magazine — Saucer Attack and Gridmania — for £4.00 each. Make all cheques or postal orders payable to D. McComb, 23 Woodlawn Drive, Dungannon, Co. Tyrone, BT70 1AJ. ■

(listing 2 continued from previous page)

```
789 REM BREAK
790 DATA20,9E,D7,E0,02,90,03,4C,48,D2,E0,01,D0,08,A9,02,8D,1E,91,A9,00,8D,89,02
,60
800 DATAA9,02,8D,1E,91,A9,0A,2D,89,02,60
809 REM IRQ
810 DATA20,5D,06,78,A5,14,8D,14,03,A5,15,8D,15,03,58,60
819 REM BEEP
820 DATA78,A9,71,8D,14,03,A9,08,8D,15,03,58,60,A9,00,8D,0E,90,8D,0C,90
830 DATAA5,CB,C5,96,85,96,F0,0E,C9,40,F0,0A,A9,C8,8D,0C,90,A9,0F,8D,0E,90,4C,BF
,EA
839 REM FETCH
840 DATAA9,00,85,C6,A5,C6,F0,FC,A9,00,85,C6,60
849 REM CLD
850 DATAA9,01,A0,FF,A2,01,20,BA,FF,A9,00,20,BD,FF,4C,D5,FF
859 REM CSV
860 DATA20,5D,06,A5,14,85,FE,A5,15,85,FF,20,FD,CE,20,5D,06,A9,01,A0,FF,A2,01,20
,BA,FF
862 DATAA9,00,20,BD,FF,A9,FE,A6,14,A4,15,4C,D8,FF
869 REM BOOM
870 DATAA9,FF,8D,0D,90,A2,0F,8E,0E,90,A2,50,A0,00,88,D0,FD,CA,D0,F8,CE,0E,90,D0
,F1
875 DATA8C,0D,90,8C,0E,90,60
879 REM ZAP
880 DATAAC,0E,90,A9,0F,8D,0E,90,A9,FE,8D,0C,90,A2,00,CA,D0,FD,CE,0C,90,AD,0C,90
,C9,7F
882 DATAD0,F1,8C,0E,90,60
889 REM PING
890 DATA20,9E,D7,8E,0C,90,20,FD,CE,20,9E,D7,86,FF,A9,0F,8D,0E,90,A0,00,A6,FF,CA
,D0,FD
892 DATA88,D0,F8,CE,0E,90,D0,F1,60
899 REM MODE
900 DATA20,9E,D7,E0,06,B0,15,E0,04,90,10,A9,F7,2D,0F,90,8D,0F,90,E0,05,F0,06,A9
,F0,8D
902 DATA05,90,60,A9,F2,8D,05,90,60,A9,08,0D,0F,90,8D,0F,90,BD,6D,09,8D,05,90,60
,FD,FF,F0,F2
909 REM RENUMBER
910 DATA20,EB,D7,86,05,A5,2B,85,03,A5,2C,85,04,A0,00,B1,03,85,FB,C8,B1,03,85,FC
,D0,07
912 DATAA0,00,B1,03,D0,01,60,A0,02,A5,14,91,03,C8,A5,15,91,03,A5,05,18,65,14,85
,14,90,02
914 DATAE6,15,A5,FB,85,03,A5,FC,85,04,18,90,CB
990 DATA
1400 FORI=6235TO7600:READA$:IFA$=""THEN5000
1410 GOSUB10000:POKEI,N:NEXT
5000 PRINT"[CLR]NOW LOAD THE 3RD PART":POKE2999,0:POKE43,184:POKE44,11:NEW
10000 A=ASC(A$)-48:B=ASC(RIGHT$(A$,1))-48:N=B+7*(B>9)+16*(A+7*(A>9)):RETURN
```

Listing 3.

```
10 PRINT"[CLR]PLEASE WAIT..."
99 REM TRACE
100 DATA20,9E,D7,8A,D0,0B,A9,0E,8D,08,03,A9,06,8D,09,03,60,A9,CF,8D,08,03,A9,09
,8D,09,03,60
104 DATAA5,9D,D0,3E,38,20,F0,FF,86,FA,84,FB,AD,86,02,85,FC,A5,C7,85,FD,A9,14,A0
,0A
106 DATA20,1E,CB,20,C9,DD,A6,FA,A4,FB,18,20,F0,FF,A5,FC,8D,86,02,AD,8D,02,F0,0D
108 DATAA0,FF,A2,FF,CA,EA,EA,EA,D0,FA,88,D0,F7,A5,FD,85,C7
110 DATA4C,0E,06,13,12,90,3C,20,20,20,20,20,3E,13,1D,00
119 REM DOKE
120 DATA20,5D,06,A5,14,85,00,A5,15,85,01,20,FD,CE,20,5D,06,A5,14,A0,00
125 DATA91,00,E6,00,90,02,E6,01,A5,15,91,00,60
129 REM PUT
130 DATA20,9E,D7,8A,20,09,E1,20,79,00,C9,2C,D0,06,20,73,00,18,90,EC,60
139 REM SCROLL
140 DATA20,9E,D7,E0,00,D0,03,4C,75,E9,38,20,F0,FF,8A,48,98,48,A9,7E,A0,0A
145 DATA20,1E,CB,68,A8,68,AA,18,20,F0,FF,A9,9E,85,DA,60,13,11,9D,94,20,00
149 REM MOT
150 DATA20,9E,D7,AD,1C,91,E0,00,D0,06,29,F3,8D,1C,91,60,09,0C,8D,1C,91,60
159 REM JOY
160 DATA78,A2,7F,8E,22,91,AC,20,91,CC,20,91,D0,F8,A2,FF,8E,22,91,A2,F7,8E,20,91
58
162 DATAAD,1F,91,CD,1F,91,D0,F8,48,29,1C,4A,C0,80,90,02,09,10,A8,68,29,20,C9,20
,98,6A
165 DATA49,8F,A8,4C,A2,D3
169 REM PEN
170 DATA20,9E,D7,E0,02,90,03,4C,48,D2,BD,06,90,A8,4C,A2,D3
179 REM PAD
180 DATA20,9E,D7,E0,02,90,03,4C,48,D2,BD,08,90,A8,4C,A2,D3
189 REM KEY
190 DATAA5,CB,AE,8D,02,F0,02,09,80,A8,4C,A2,D3
199 REM SWITCH
200 DATAAD,11,91,29,40,A8,4C,A2,D3
990 DATA
1400 FORI=7083TO7600:READA$:IFA$=""THEN5000
1410 GOSUB10000:POKEI,N:NEXT
5000 FORI=1040TO2840:POKEI,PEEK(I+4600):NEXT:SYS1040
10000 A=ASC(A$)-48:B=ASC(RIGHT$(A$,1))-48:N=B+7*(B>9)+16*(A+7*(A>9)):RETURN
```

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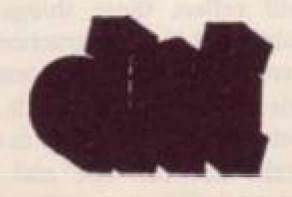
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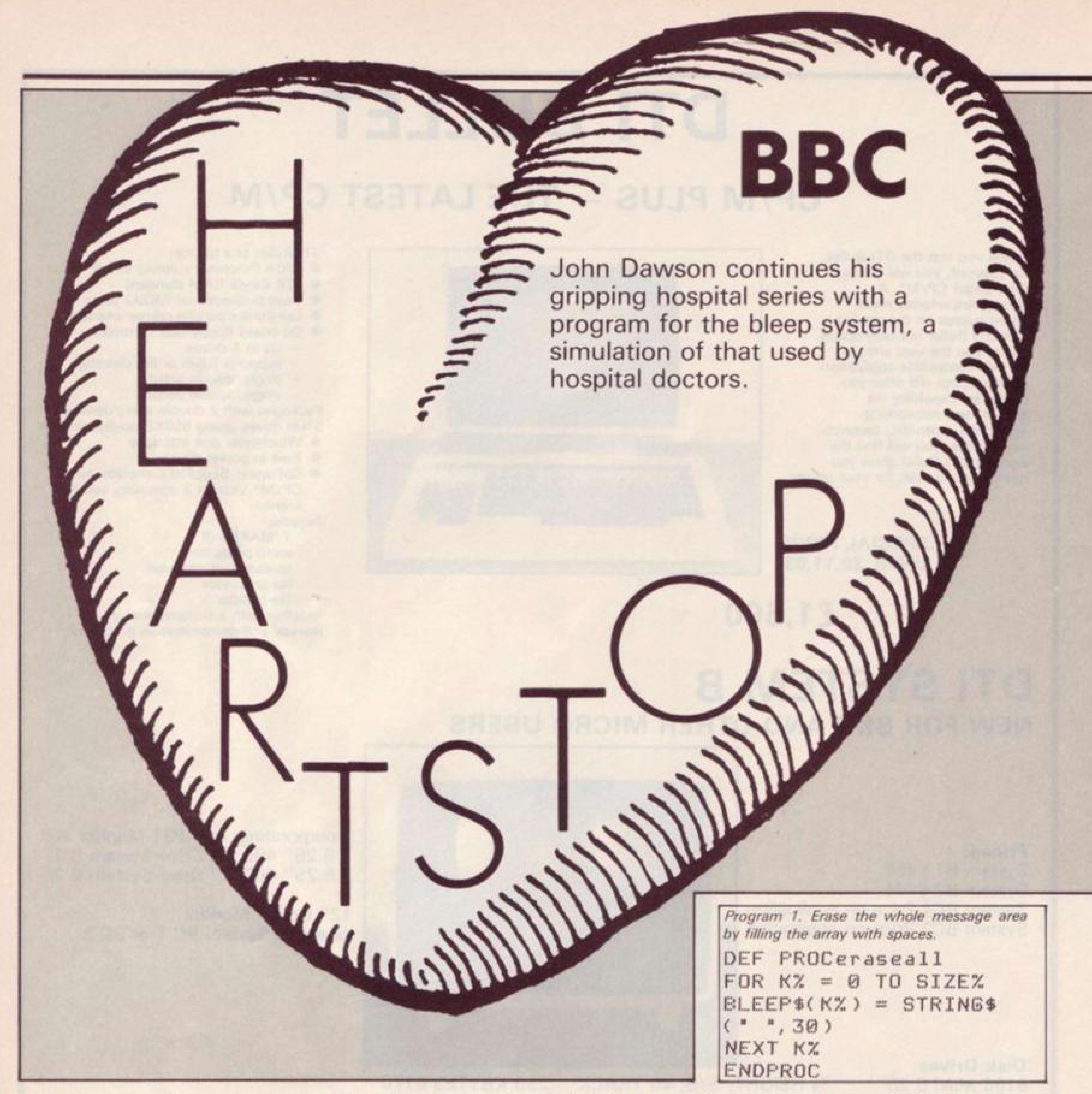
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Program 1. Erase the whole message area by filling the array with spaces.

```
DEF PROCeraseall
FOR K% = 0 TO SIZE%
BLEEP$(K%) = STRING$
(" ",30)
NEXT K%
ENDPROC
```

HOSPITALS ARE not what they used to be. A place for Christmas in hospital used to be something that was sought after, a guarantee of physical and social warmth, adequate food and care and attention. Regular Christmas attenders were welcomed on to the wards with weary affection by nursing sisters who remembered last year's complaint and the year before.

Communications systems have also lost some of the old-fashioned charm of the fifties and sixties. Radiopaging bleeps are now universal and have displaced a number of ingenious methods of attracting a doctor's attention when he or she was needed by the telephone operator, or in a different part of the hospital.

As far as I can remember it was the Royal Isle of Wight County Hospital in Ryde which had the most charming system I ever saw. Columns of either four or five different coloured lights were suspended from the ceilings of the corridors at conspicuous points. When a person was needed I think that a combination of lights was selected, possibly with a short bell sound to make people look at the new code.

Dr. Finlay, for example, would be allocated Code Red/Yellow on taking up his employment at the hospital while Dr. Kildare would be given Code Blue/Green. The colours would have been relevant only to reinforce the position of whichever of the lights was selected and a column of five lights could produce 31 combinations.

Voice message to doctor

Modern times have changed all that. Most bleep systems will now alert a specific recipient that he should telephone his answering number on the internal exchange to be connected to the person making the call. Most systems will have a broad band capability that allows the switchboard operator to give a voice message directly to the doctor. When a cardiac arrest bleep goes off you may see doctors, nurses and technicians running down the corridors holding their bleep to one ear while it announces which ward or unit they should head towards.

Less dramatic messages may be held by the switchboard if the doctor fails to answer immediately. If the doctor is in the middle of stitching a patient's lacerated arm or is busy putting up a drip, the matter will generally have to wait.

If the doctor is unable to answer the bleep or cannot ask another member of staff to take a message it is likely to go off again a few minutes later. If there is still no reply the message may be referred to a more senior doctor.

Heartstop should reflect these things as accurately as possible and the construction of the bleep procedures for the game is of central importance for this is the way in which the player's tasks are set. Answering a bleep in real life is likely to take between one and ten minutes on the initial call but may then

Program 2.

```
DEF PROCbleepdisplay
FOR K% = 0 TO SIZE%
PRINT BLEEP$(K%)
NEXT K%
ENDPROC
```

Program 3.

```
DEF PROCupstack(X%)
LOCAL I%
IF BLEEP$(SIZE%) <> STRING$(" ",30) THEN
PROCstackfull: REM call the consultant!
FOR I% = (SIZE%-1) TO X% STEP -1
BLEEP$(I%+1) = BLEEP$(I%)
NEXT I%
BLEEP$(X%) = STRING$(" ",30)
ENDPROC
```

involve further telephone calls or the doctor's attendance in a different part of the hospital.

Each time the bleep goes off in Heartstop the game clock will be advance by a number of minutes to reflect the time taken to get to a telephone. Deciding what to do about the message might be dealt with in real-time multiplied by five or 10 times.

In other words you can take as long as you like to respond to the bleep message but game time will be running at five or ten times normal speed. While you are making your decision the program should be checking the state of the game and if you run over an internal deadline your bleep may go off again.

The bleep section

The following functions are likely to be needed for the bleep section of Heartstop:

■ Erase all the bleep messages. In other words, clear the stack.

■ Generate a bleep message by using random numbers to Read strings from Data statements.

■ Generate a bleep sound.

■ Check various events withing the program and generate a bleep if the game time has passed a certain value, for example, or if a patient's condition has deteriorated.

■ Display all the current bleep messages on the stack.

■ Flash an urgent bleep message on to the current screen display.

■ Allow the player to select a bleep message to be answered, delete that message from those waiting to be answered, and close up any remaining messages.

■ Open up a space for a new message in the stack. If a new message is urgent it should be placed on the top of the stack.

■ Repeat a bleep signal if there is no response from the player.

■ Call in the consultant if the stack of messages exceeds the allowed total or if an urgent bleep is unanswered within a couple of minutes. This procedure will terminate the game with some prejudice to the player's

Program 4.

```
DEF PROCdownstack(X%)
LOCAL I%
FOR I% = X% TO SIZE%
BLEEP$(I%) = BLEEP$(I%+1)
NEXT I%
BLEEP$(SIZE%) = STRING$(" ",30)
ENDPROC
```

future references and career prospects.

I had expected to set out listings for most of the procedures necessary to achieve these functions and show how they interfaced to the existing Heartstop program. Alas and alack-a-day I did not make a back-up copy of the cassette I was working with. In a fit of enthusiasm with the Maplin Modem I downloaded a program for the BBC machine from the London TBBS and Saved it on a cassette. At least I think that's what happened because I cannot find it now.

However, here are the outline listings for some of the procedures. They have a more general value than their inclusion in a game program might suggest. Used with a simple Repeat . . . While loop to input lines of text they couald form the basis of a very simple line oriented text editor.

Somewhere in the main body of the program you must dimension the array that will be used to hold the lines of text, each line will contain one message:

SIZE% = 5: REM SIZE% can be altered to set the maximum number of lines or messages.
DIM BLEEP$(SIZE%)

Note in program 1 that the length of each string has been set to 30 characters. In a more general text editing program that value could be changed to a variable such as

LINE LENGTH %

which could be set at the start of the program.

Program 2 assumes that the screen is in a

Program 5.

```
SIZE% = 120:REM approx. 2 pages of A4 text
DIM BLEEP$(SIZE%)
REPEAT: REM start of Main Command Level
INPUT C$
IF C$ = "w" THEN PROCwrite
... Here you must write other lines to call procedures to
display, print,or edit the text held in BLEEP$.
UNTIL FALSE: REM end of MCL

DEF PROCwrite
PROCeraseall
LINECOUNT% = 0
REPEAT
INPUT LINE L$
IF L$ = ".quit." THEN ENDPROC
BLEEP$(LINECOUNT%) = L$
LINECOUNT% = LINECOUNT% + 1
UNTIL FALSE
ENDPROC
```

suitable state to display the messages and that there are no odd text windows in force.

Program 3 takes a parameter into the procedure from the main body of the program to set the position at which the stack should be split to insert a new message. All the messages above the designated point (X%) are moved up by transferring

BLEEP$(SIZE %-1) TO BLEEP$(SIZE%)

and so on all the way back down to X%. The string BLEEP$(X%) is then filled with spaces and is ready to receive the new message when the program returns from the procedure.

To close-up the message stack after a message has been removed fro action by the doctor you will need to move any remaining messages down by one place, eliminating the chosen entry — see program 4.

You can write a loop

Using a few more lines of Basic you can write a loop that will continue to ask for text until you type 'quit' when you will be returned to a Main Command Level — see program 5.

Named procedures and the Repeat . . . While construction are two of the better features of BBC Basic. Their use is extensively covered, among other things, in *Structured Programming with BBC BASIC,* written by Roy Atherton and published by Ellis Horwood. It costs £6.50 and must be among the best value in computer books on the market at the moment.

The book is the perfect Christmas present for teenagers who are using computers at school — it is published jointly by Heinemann Computers in Education — and for anyone who wants to learn how to write good, effective programs. ■

Figure 1. The bleep message stack before and after removal of a message.

1 New patient waiting in Casualty — TOP OF STACK
2 Please 'phone your bank manager
3 Mrs Williams blood pressure dropping
4 Peter Benthams relatives are waiting
5
6 — BOTTOM OF STACK

If the doctor chooses to deal with the third message the Downstack procedure will be used to remove it from the stack and close up the remaining messages:

1 New patient waiting in Casualty — TOP OF STACK
2 Please 'phone your bank manager
3 Peter Benthams relatives are waiting
4
5
6 — BOTTOM OF STACK

RESPONSE FRAME

Do you have a problem? Your manual is incomprehensible or you just cannot get the hang of that programming trick you tried — whatever it is, Tim Hartnell will do his best to answer your queries. Please include only one question per letter and mark them "Response Frame".

SAVING ARRAYS

■ **I own a ZX Spectrum and have written a fairly large program for book-keeping. Each time the accounts are updated, the date is Saved onto cassette using the Spectrum's facility for Saving arrays. Unfortunately, there are 15 separate arrays, which means that the Enter key has to be hit each time. I wonder if there is a way around this, apart from the obvious one of Saving the entire program on each occassion?**

D A C Patrick,
Leeds.

THE SIMPLEST solution, and one which may not be satisfactory, would be to Save your data in one enormous string or numeric array, using parts of this giant array to take the place of the 15 smaller arrays you are using at the moment.

JOYSTICKS

■ **I have just bought a cassette recorder for my Vic-20 and have been looking for some good quality games. But most of the games I have come across need a joystick. If I buy a joystick, will it be compatible with any game which needs a joystick?**

Shamsher Johal,
Sunnyhill, Derby.

ANY JOYSTICK advertised for the Vic-20 will work with any Vic-20 program demanding a joystick. The joystick provided by Commodore for the Vic-20, although it looks cheap, is reliable and robust. I have been using mine for over two years, and although the sheath broke off several months ago, it still functions perfectly well. You should have a good look at this unit before deciding that you need to buy a more expensive one.

JUST A MINUTE

■ **I am writing a program for a ZX-81 to help me with my job. I need to work out the efficiency of machines, to find any time lost. The problem is that I cannot figure out how to get the computer to work out the running time, say from 8.15 to 1.50, which is five hours 35 minutes. I need the minutes in decimal, which makes the time 5.58. If I put the time in, in decimal, the program works perfectly, i.e., 13.83-8.25 = 5.58. I would like to be able to enter the time as ordinary time so that other people in the factory could use the program. Your help would be appreciated.**

Jim Brush,
Belfast.

THERE IS OFTEN a problem in programs when non-standard units are being used. You must first get everything into a similar form to compare values. If the second decimal place is not vital, you could ask for the input in three stages; "enter hours", "is this am or pm?", then "enter minutes". This would be needed twice, for the starting time and the ending time. The response to the second question — is this am or pm? — could be used to add 12 where needed to the hours figure. You can change the minutes figure into a decimal in the program as follows:

```
PRINT "ENTER MINUTES"
INPUT MIN
LET MIN = (INT(100*MIN/60))/100
```

Once the two figures have been compared, you can change your decimal "minutes" into ordinary ones by multiplying the decimal figure — such as 0.53 — by 60. This should work closely enough for your needs.

BBC PROCESSOR

■ **Can you tell me if it is possible to use Z-80 machine code with the second processor attachment for the BBC Micro? Your answer will affect by choice of computer.**

Mrudang Kalaria,
Manor Park,
London.

THE SECOND PROCESSOR for the BBC can be either 6502 or Z-80. They are not available at present, but are expected around March 1984.

COMPETIBILITY

■ **I have recently purchased a Vic-20 colour computer with a 16K RAM expansion. I would like to know whether hardware for the Pet computer is compatible with the Vic-20. For instance, can the Pet printer run on the Vic-20?**

Tim Adams,
Didcot, Oxfordshire.

NO. THIS IS because the Pet peripherals communicate via the IEEE/488 interface whereas the Vic-20 — and the Commodore 64 — use a proprietory serial bus.

ZX-81 IN USA

■ **Is it possible to modify my home-built ZX-81 to operate with a TV set in the U.S.A? I realise that I will have to use a power supply suitable for the American mains voltage, but will I have to replace the TV signal modulator?**

R H Pond,
Carnoustie.

IT IS NOT A simple matter to make the conversion you describe, because of the ZX-81's ULA. And there is little point in making such a change. I have seen the TS-1000 — a ZX-81 with 2K on-board — on sale in the U.S.A. for around £12 (!) so the simplest thing to do would be to buy one of these when you get there.

RIBBON HELP

■ **Our computer club has recently been given a Nascom Micro Imp printer. However, as Nascom have gone out of business, we have been unable to get hold of a ribbon. Could you or one of the readers please help?**

Ian Anderson,
The Universal Micro Club,
35 Surrey Close,
Corby,
Northants NN17 2IG.

I HAVE INCLUDED your address in full so that anyone who can help can get in touch with you directly.

CONVERSION

■ **About a year ago I purchased a ZX-81 with 16K RAM, which I extended with the Quicksilva sound board. Since then, I have sold my ZX-81 and bought a 48K Spectrum. I have seen some advertisements for connectors to convert ZX-81 hardware to the Spectrum. Could you advise me whether such connectors would be useful? The main chip on the sound board is the AY-3-8910 which I have seen advertised for Spectrum sound boards. This spurred me to think that my three channel sound is not redundant. Is this true?**

R Woods,
Seaton Sluice,
Tyne and Wear.

THE QS SOUND board is probably mapped to the ZX-81 memory map above the ROM but before the RAM. This area is occupied by the second half of the 16K ROM on the Spectrum. Because of this, Spectrum sound boards are mapped to the I/O ports rather than the memory map. The answer then, I'm afraid, is no.

JOYSTICK CONTROL

■ **I read *Your Computer* every month and I think it is a great help to my programming. I would like to ask one small favour. I have an unexpanded Vic-20 and a joystick, which I want to use in a program I am writing. However, I do not know how to get the Vic-20 to understand that I want to use the joystick. Could you please tell me what commands to use? Will these change if I expand my Vic-20?**

S A Veitch,
Bletchley,
Milton Keynes.

THE ROUTINE TO control joysticks is not very long but it is a little tricky to use. You initialise it as follows:

```
FOR Z=0 T02:FORJ=0T02:READJS
(J,Z):NEXTJ,Z
DATA-23,-22,-21,-1,0,1,21,22,23
```

To actually read the joystick, you include the following lines:

```
POKEDD,127:S3=-3((PEEK(PB)AND
128)=0):POKEDD,255
P=PEEK(PA):S1=-((PAND8)=0):
S2=((PAND16)=0):S0=((PAND4)
=0)
FR=-((PAND32)=0):X=S2+S3:Y=
S0+S1
```

This allows you to move an object around in any direction — including diagonally. I suggest you get hold of the *Vic-20 Programmers' Reference Guide* — from which the above routine was adapted — for a full program showing the routine in action, and an explanation of how it works. The routine will work on any size Vic-20. A machine-code routine to read joysticks is given in the book *More Games For Your Vic-20* by Andrew Nelson, published by Virgin Books.

LEARNING MC

■ **I am going to purchase a ZX Spectrum and, now that I have learned Basic, I think my next step should be to learn machine code. I do not know any of this language. What should I buy to help me learn it?**

Tim Thakur,
Al-Ain,
United Arab Emirates.

THE EASIEST WAY to learn Spectrum machine code is with the help of books, plus a friend who already knows how to program in it. If you do not have any friends who can program in machine code, you could team up with one who also wants to learn it, share out the cost of the books, then help each other. It is not particularly easy to learn but machine-code skills can be acquired with patience. If you look through the advertisements in this issue of *Your Computer* you will see there are six or seven books available to help you with this.

UNFAIR DEAL

■ **I recently ordered an add-on product for my Spectrum. It took seven weeks to arrive rather than the three mentioned in the advertisement. While the demo-tape loaded alright, none of my own programs did, neither did a copy of the Spectrum program I made. On telephoning the company, I was told that my cassette recorder did not give enough volume, and I needed to buy an Atari cassette deck. The sales literature for the master unit claims: "The unit also enhances the saving signal, so that cheaper cassette recorders can be used." I feel they are contravening the Trade Descriptions Act. I also feel that £50 for an Atari cassette recorder to make a £54 add-on work is excessive.**

I J Jones,
Hartley, Plymouth.

I AGREE, AND THINK you have been treated badly. Send the unit back and demand a full refund. Such companies do not deserve your money, or anyone else's. ■

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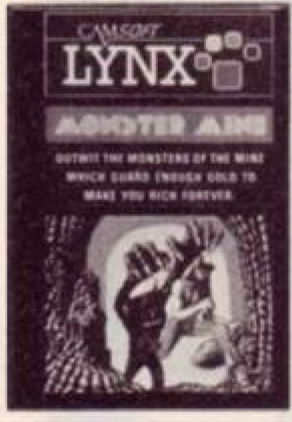
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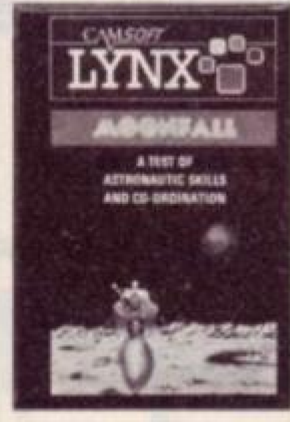
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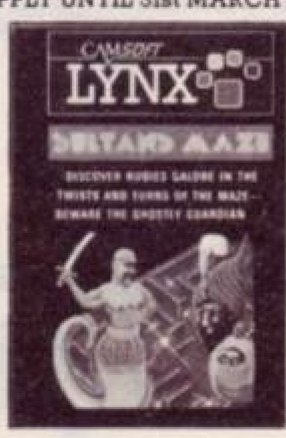
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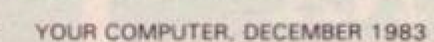
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Bricks

Graham Pearce,
Harrogate,
North Yorkshire.

SPECTRUM

THIS PROGRAM WILL just fit into a 16K Spectrum and works on the 48K Spectrum as well. The object of the game is to knock all the bricks out of a wall at the top while trying to protect a row of bricks at the bottom. A bonus score of 100 is added after each 1,000 scored. The game is over after all the bottom row of bricks have been knocked out. If all the top bricks are knocked out they are then replaced, leaving the bottom row as it is. 10 points are awarded for each brick at the top but no score is given for a brick on the bottom which is knocked out.

On running the game there will be a long pause while the machine code is Poked and the message

PLEASE WAIT A MOMENT

will appear, followed by a prompt

THIS IS WHERE YOU ENTER YOUR SKILL LEVEL.

Level 1 is the easiest and level 4 the hardest. Only integers are accepted. To move the bat:

1 — Slow ball speed left.
5 — Slow right.
1 and 2 together — Fast — two times the ball speed — Left.
4 and 5 together — Fast right.

```
   1 REM G.Pearce 1983
   2 SAVE "WALLS" LINE 5
   3 STOP
   5 CLEAR VAL "31599"
   6 PRINT AT 10,6;"Please Wait a Moment"
   7 FOR g=USR "a" TO USR "e"+7: READ a$: POKE g,VAL a
$: NEXT g
   8 DATA "0","24","60","126","126","60","24","0","255
","128","128","128","128","128","128","255","255","1",
"1","1","1","1","1","255","0","1","3","7","7","3","1",
"0","0","128","192","224","224","192","128","0"
  10 FOR g=VAL "32250" TO VAL "32425": READ a$: POKE g
,VAL a$: NEXT g
  20 DATA "1","1","0","0","22","10","10","62","2","205
","1","22","1","39","0","17","0","125","205","60","32"
,"1","3","0","17","254","125","205","60","32","62","32
","215","62","255","125","237","75","250","125","237",
"66","237","75","252","125","237","74","34","255","125
","1","10","0","17","56","124","205","60","32","1","3"
,"0","17","254","125","205","60","32","205","112","123
","62","144","215"
  22 DATA "58","0","126","254","0","32","18","62","0",
"50","251","125","60","50","253","125","33","15","2","
17","10","0","205","181","3","58","0","126","254","31"
,"32","18","33","0","2","17","10","0","205","181","3",
"62","0","50","253","125","60","50","251","125","58","
255","125","254","0","32","18","33","0","2","17","10",
"0","205","181","3","62","0","50","250","125","60","50
","252","125","58","255","125","254","20","32","18","3
3","0","2","17","10","0","205","181","3","62","0","50"
,"252","125","60","50","250","125","201"
  33 FOR g=VAL "31600" TO VAL "31795": READ a: POKE g,
a: NEXT g
  34 DATA 205,221,126,62,32,185,200,62,145,185,32,77,5
8,250,125,254,1,32,9,50,252,125,61,50,250,125,24,14,58
,5,125,254,20,32,7,50,252,125,61,50,250,125,62,32,215,
62,32,215,62,8,215,62,8,215,58,255,125,254,20,32,17,58
,219,126,60,50,219,126,33,0,1,17,30,0,205,181,3,201
  35 DATA 205,39,125,58,220,126,60,50,220,126,201,58,2
50,125,254,0,40,18,58,255,125,60,50,255,125,62,0,50,25
0,125,60,50,252,125,24,16,58,255,125,61,50,255,125,62,
0,50,252,125,60,50,250,125,58,251,125,254,1,32,9,58,0,
126,60,50,0,126,24,7,58,0,126,61,50,0,126,62,147,185,3
2,9,62,1,50,251,125,61,50,253,125,62,148,185,32,9,62,1
,50,253,125,61,50,251,125,62,2,205,1,22,1,3,0,17,254,1
25,205,60,32,201
  36 FOR g=VAL "31800" TO VAL "32140": READ a$: POKE g
,VAL a$: NEXT g
  40 DATA "22","7","12","32","147","143","143","143","
148","32","1","254","247","237","120","254","255","200
","254","254","40","38","254","252","32","35","58","58
","124","254","0","200","61","50","58","124","62","2",
"205","1","22","1","10","0","17","56","124","205","60"
,"32","58","58","124","254","0","200","61","50","58","
124","201","254","239","40","22","254","231","192","58
","58","124","254","26","200","60","50","58","124","1"
,"10","0","17","56","124","205","60","32","58","58","1
24","254","26","200","60","50","58","124","201"
  46 DATA "0","0","205","1","126","6","10","197","1","
1","2","33","0","0","17","0","0","237","176","193","16
","241","205","66","124","58","219","126","254","16","
40","43","58","220","126","254","45","32","219","175",
"50","252","125","50","253","125","60","50","250","125
","50","251","125","62","10","33","0","6","17","5","0"
,"229","205","181","3","225","17","8","0","167","237",
"82","32","240","201","6","75","197","33","0","1","17"
,"1","0","229","205","181","3","225","17","16","0","16
7","237","82","32","240","193","16","233","201"
  47 DATA "0","22","21","0","20","1","83","99","111","
114","101","32","48","48","48","48","48","32","32","76
","101","118","101","108","32","49","32","32","72","10
5","32","48","48","48","48","48","32","32","20","0"
  48 DATA "58","14","125","60","254","58","32","7","62
","48","50","14","125","24","4","50","14","125","201",
"58","13","125","60","254","58","32","7","62","48","50
","13","125","24","4","50","13","125","201","33","15",
"0","17","40","0","229","205","181","3","225","17","16
","0","167","237","90","125","254","255","32","237","6
2","49","50","13","125","58","12","125","60","254","58
","32","7","62","48","50","12","125","24","4","50","12
","125","201","58","11","125","60","254","58","32","6"
,"62","48","50","11","125","201","50","11","125","201"
  49 FOR g=VAL "32475" TO VAL "32599"
  50 READ a$: POKE g,VAL a$: NEXT g
  60 DATA "0","0","42","54","92","36","17","128","32",
"205","27","127","20","30","144","33","58","127","213"
,"237","91"
  70 DATA "132","92","14","2","6","4","26","190","32",
"12","20","16","-7","35","13","32","-13"
  80 DATA "209","6","0","74","201","6","0","9","209","
20","123","186","32","-34","42","123","92","30","165",
"205","27","127","1","0","0","201"
  90 DATA "1","8","0","213","237","91","132","92","26"
,"20","190","32","10","35","13","32","-9","209","6","0
","74","209","201","9","209","20","123","186","32","-3
0","201"
 100 DATA "15","0","240","0","255","0","0","15","15","
15","240","15","255","15","0","240","15","240","240","
240","255","240","0","255","15","255","240","255","255
","255"
8995 REM IN LINE 9000 A$        COMPRISES OF GRAPHIC B
 AND C
8999 CLEAR : GO TO 9410
9000 LET a$="": FOR a=VAL "0" TO VAL "31" STEP VAL "2"
: PRINT ; PAPER VAL "2";AT VAL "20",a;a$: NEXT a
9001 FOR g=VAL "0" TO VAL "2": FOR a=VAL "0"+g TO VAL
"31"-g STEP VAL "2": PRINT ; PAPER g+4;AT g,a;a$: NEXT
 a: NEXT g
9100 RANDOMIZE USR VAL "31900"
9105 POKE VAL "32255",VAL "19": POKE VAL "32256",VAL "
15"
9200 IF PEEK VAL "32476"=VAL "45" THEN POKE VAL "32476
",0: GO TO VAL "9001"
9210 LET a=((PEEK (VAL "32012")-48)*VAL "1000")+((PEEK
 (VAL "32013")-48)*VAL "100")+((PEEK (VAL "32014")-48)
*VAL "10")+(PEEK (VAL "32015")-48)
9212 LET A$="
9215 FOR B=VAL "1" TO VAL "32": LET A$(B)=SCREEN$ (21,
B-1): NEXT B
9220 BORDER VAL "1": CLS
9230 FLASH 1: PRINT AT 21,0;A$;AT 9,11; FLASH 1;"GAME
 OVER"
9300 LET b=((PEEK (VAL "32031")-48)*VAL "1000")+((PEEK
 (VAL "32032")-48)*VAL "100")+((PEEK (VAL "32033")-48)
*VAL "10")+(PEEK (VAL "32034")-48): IF a>b THEN POKE V
AL "32031",PEEK VAL "32012": PRINT AT 10,11;"WELL  DON
E": BEEP 0.5,3: POKE VAL "32032",PEEK VAL "32013": POK
E VAL "32033",PEEK VAL "32014": POKE VAL "32034",PEEK
VAL "32015": PRINT AT 11,4;"YOU HAVE THE HIGH SCORE"
9400 FLASH 0: LET A$="": LET A=0: LET B=0
9410 INPUT "SKILL LEVEL (1-4)"; LINE A$: IF LEN A$<>1
OR CODE A$<49 OR CODE A$>52 THEN BEEP 0.1,-10: GO TO 9
410
9420 LET A=VAL A$-1
9430 LET B=3-A: POKE VAL "31908",B: POKE VAL "32024",A
+49: CLEAR : PRINT AT 8,6;"PRESS ANY KEY TO PLAY": PAU
SE 0: BORDER 2
9431 FOR B=VAL "32012" TO VAL "32015": POKE B,VAL "48"
: NEXT B
9435 POKE VAL "32475",VAL "0": POKE VAL "32476",VAL "0
": POKE VAL "32250",1: POKE VAL "32251",1: POKE VAL "3
2252",0: POKE VAL "32253",0: POKE VAL "32255",10: POKE
 VAL "32256",10: RUN VAL "9000"
```

Labyrinth

Tony Brown,
Preston,
Lancashire.

DRAGON

LABYRINTH WILL run on a Dragon 32 or 64 and the Tandy Colour Computer with extended Basic and at least 16K. Instructions are in the program. Level 1 plays normally but if level 2 is chosen it becomes impossible to retrace your steps because the locations are filled as you leave them. The only record of the maze is stored on the text screen and this is also used to show the map. To return from the map to the high-resolution display press any key. Movement instructions are included in the program. Save program using CSave before running.

Program notes.

10-18 Movement and keyboard routines.
19-21 Map routine.
22-37 This section decided where to put each wall on the high resolution screen according to the plan on the text screen.
38-51 Instructions.
52-57 Set up variables.

Remove the Poke in line 8 if your computer cannot handle double speed.

```
1 REM LABYRINTH-TONY BROWN
2 REM JULY 1983-YOUR COMPUTER
3 REM DRAGON 32K,64K OR
4 REM TANDY COLOR COMPUTER
5 REM 16K AND EXTENDED BASIC
6 REM REMOVE THIS POKE IF YOUR
7 REM MACHINE CANNOT HANDLE IT
8 POKE&HFFD7,0
9 PCLEAR8:DIM X(5),N$(4):PMODE4,1:PCLS:PMODE4,5:PCLS:G
OTO 38
10 A$=INKEY$:IF A$="" OR (A$<>"1" AND A$<>"2" AND A$<>
"M" AND A$<>" " ) THEN 10 ELSE SOUND 150,1
11 IF A$="1" THEN D=D-1
12 IF A$="2" THEN D=D+1
13 IF D=0 THEN D=4 ELSE IF D=5 THEN D=1
14 IF A$=" " AND F=0 THEN PP=PP+X(D)
15 IF A$="M" THEN T=T+1:GOTO 19
16 F=0:PCLS:D1=X(D):D2=X(D-1):D3=X(D+1):GOSUB 22
17 PCOPY 5 TO 1:PCOPY 6 TO 2:PCOPY 7 TO 3:PCOPY 8 TO 4
18 POKE 1023+PP,LL:GOTO 10
19 SCREEN0,0:PRINT@448,"YOU ARE FACING ";N$(D);:POKE 1
023+PP,21
20 PRINT@480,"TIME ";INT(TIMER/50)+T*5;"SECONDS";
21 IF INKEY$="" THEN 21 ELSE PMODE4,1:SCREEN1,1:PMODE4
,5:GOTO 16
22 A$=CHR$(PEEK(1023+PP+D1)-64):IF A$=" " THEN 23 ELSE
 IF A$="£" THEN 55 ELSE F=1:RETURN
23 IF CHR$(PEEK(1023+PP+D1+D2)-64)="*" THEN LINE(0,0)-
(49,37),PSET:LINE-(49,154),PSET:LINE-(0,191),PSET ELSE
 LINE(0,37)-(49,154),PSET,B
24 IF CHR$(PEEK(1023+PP+D1+D3)-64)="*" THEN LINE(255,1
```

(continued on page 211)

(continued from page 209)

```
91)-(206,154),PSET:LINE-(206,37),PSET:LINE-(255,0),PSE
T ELSE LINE(255,37)-(206,154),PSET,B
25 A$=CHR$(PEEK(1023+PP+2*D1)-64):IF A$=" " THEN 26 EL
SE IF A$="*" THEN LINE(49,37)-(206,154),PSET,B:RETURN
ELSE LINE(49,37)-(206,154),PSET,BF:RETURN
26 IF CHR$(PEEK(1023+PP+2*D1+D2)-64)="*" THEN LINE(49,
154)-(88,125),PSET:LINE-(88,66),PSET:LINE-(49,37),PSET
 ELSE LINE(49,66)-(88,125),PSET,B
27 IF CHR$(PEEK(1023+PP+2*D1+D3)-64)="*" THEN LINE(206
,154)-(167,125),PSET:LINE-(167,66),PSET:LINE-(206,37),
PSET ELSE LINE(206,66)-(167,125),PSET,B
28 A$=CHR$(PEEK(1023+PP+3*D1)-64):IF A$=" " THEN 29 EL
SE IF A$="*" THEN LINE(88,66)-(167,125),PSET,B:RETURN
ELSE LINE(88,66)-(167,125),PSET,BF:RETURN
29 IF CHR$(PEEK(1023+PP+3*D1+D2)-64)="*" THEN LINE(88,
125)-(109,109),PSET:LINE-(109,82),PSET:LINE-(88,66),PS
ET ELSE LINE(88,82)-(109,109),PSET,B
30 IF CHR$(PEEK(1023+3*D1+D3+PP)-64)="*" THEN LINE(167
,125)-(146,109),PSET:LINE-(146,82),PSET:LINE-(167,66),
PSET ELSE LINE(167,82)-(146,109),PSET,B
31 A$=CHR$(PEEK(1023+PP+4*D1)-64):IF A$=" " THEN 32 EL
SE IF A$="*" THEN LINE(109,82)-(146,109),PSET,B:RETURN
 ELSE LINE(109,82)-(146,109),PSET,BF:RETURN
32 IF CHR$(PEEK(1023+PP+4*D1+D2)-64)="*" THEN LINE(109
,109)-(117,103),PSET:LINE-(117,88),PSET:LINE-(109,82),
PSET ELSE LINE(109,88)-(117,103),PSET,B
33 IF CHR$(PEEK(1023+PP+4*D1+D3)-64)="*" THEN LINE(146
,109)-(138,103),PSET:LINE-(138,88),PSET:LINE-(146,82),
PSET ELSE LINE(146,88)-(138,103),PSET,B
34 A$=CHR$(PEEK(1023+PP+5*D1)-64):IF A$=" " THEN 35 EL
SE IF A$="*" THEN LINE(117,88)-(138,103),PSET,B:RETURN
 ELSE LINE(117,88)-(138,103),PSET,BF:RETURN
35 IF CHR$(PEEK(1023+PP+5*D1+D2)-64)="*" THEN LINE(117
,103)-(123,99),PSET:LINE-(123,92),PSET:LINE-(117,88),P
SET ELSE LINE(117,92)-(123,99),PSET,B
36 IF CHR$(PEEK(1023+PP+5*D1+D3)-64)="*" THEN LINE(138
,103)-(132,99),PSET:LINE-(132,92),PSET:LINE-(138,88),P
SET ELSE LINE(138,92)-(132,99),PSET,B
37 IF CHR$(PEEK(1023+PP+6*D1)-64)="£" THEN LINE(123,92
)-(132,99),PSET,BF:RETURN ELSE LINE(123,92)-(132,99),P
SET,B:RETURN
38 CLS:PRINT@43,"LABYRINTH";:PRINT@75,"---------";
39 PRINT@139,"TONY BROWN";:PRINT@171,"----------";
40 PRINT@192,"    THE OBJECT OF THE GAME IS TO ESCAPE F
ROM THE LABYRINTH AS    QUICKLY AS IS POSSIBLE.USING T
HEMAP ADDS TO YOUR TIME.        THE EXIT IS WHITE
 ALL OTHER  WALLS ARE BLACK."
41 PRINT@451,"PRESS ANY KEY TO CONTINUE";:EXEC 41194
42 CLS:PRINT@43,"LABYRINTH";:PRINT@75,"---------";
43 PRINT@135,"SPACE BAR--FORWARD";
44 PRINT@205,"M--MAP";
45 PRINT@268,"1---LEFT";
46 PRINT@332,"2--RIGHT";
47 IF L=0 THEN PRINT@456,"LEVEL(1 OR 2)";:INPUT L: IF
L<1 OR L>2 OR L<>INT(L) THEN L=0:GOTO 47
48 PRINT@453,"press"+CHR$(128)+"any"+CHR$(128)+"key"+C
HR$(128)+"to"+CHR$(128)+"start";
49 IF L=1 THEN LL=96 ELSE LL=106
50 SCREEN0,1
51 IF INKEY$="" THEN 51 ELSE CLS
52 PRINT "****************£*****************       *
 ** ****   *****   ** **** ***** **     ** ****** ****
 ***  ****     **      ***** *****  ***  *** ********* *
**** ****    *** ***    *****  * ***** **** ***    *   *
* *   **             **";
53 PRINT "* *** *** *** * * **** ***** **** *** *    **
*   *  **   ***  ****       * ***    *    *** * *** ** ***
*****  ** *** * *** * *** ** **  ***   **  ****  *****
 **    **        *           *           **************
*******************";
54 PP=385+RND(30):D=2:X(0)=-1:X(1)=-32:X(2)=1:X(3)=32:
X(4)=-1:X(5)=-32:N$(1)="NORTH":N$(2)="EAST ":N$(3)="SO
UTH":N$(4)="WEST ":T=0:TIMER=0:GOTO 19
55 CLS:PRINT"WELL DONE.YOU HAVE ESCAPED FROM THE MAZE
IN";INT(TIMER/50)+T*5;"SECONDS";:POKE&HFFD6,0
56 PRINT@453,"ANOTHER GAME(Y OR N)";
57 A$=INKEY$:IF A$="Y" THEN RUN ELSE IF A$<>"N" THEN 5
7 ELSE STOP:END
```

Golf

Richard Williams, Burscough, Lancashire.

ZX-81

THIS GOLF PROGRAM for the 16K ZX-81 takes you round an 18 hole course and generates a different layout for each hole. Before making your stroke you must choose the direction and hitting strength. Direction is indicated by inputting a number from 1 to 12, where the directions correspond to the positions of the numbers on a clockface. Thus 6 indicates South and 9 West.

The program contains a short machine-code routine, so your first step is create a Rem statement followed by 13 Xs. Now use program 1 to Poke in the following numbers: 6, 176, 62, 8, 215, 215, 215, 16, 0, 46, 43, 0, 201. Press Newline after each entry.

You can now enter the rest of the program deleting lines 10 to 40 of program 1 but retaining line 1. During play press Newline to proceed — at the start of the game and at the start of each new hole.

```
   1 REM XXXXXXXXXXXXX
   2 FAST
   5 GOTO 500
  10 LET L=LEN A$
  15 FOR I=0 TO (Y1-L)*F/L
  20 PRINT AT X1+RND+X0,Y0+(Y1-L
)*RND;A$
  30 NEXT I
  40 RETURN
 127 FOR Z=1 TO 2
 500 LET P6=PI/6
 510 LET COURSE PAR=0
 529 LET DFILE=PEEK 16396+256*PE
EK 16397+1
 530 LET HOLE=0
 535 LET GREEN=3E3
 540 LET BUNKER=3500
 545 LET TREES=4E3
 550 LET LAKE=4500
 560 LET ROUGH=5E3
 565 LET RUF=0
 570 LET K$="
                                "
 600 LET PAR=INT (3+4*RND)
 602 FAST
 610 LET SHOTS=0
 620 LET YARDS=10*INT (10*(PAR-2
+RND))
 622 LET S1=32/YARDS
 625 LET HOLE=HOLE+1
 630 LET O$="■"
 640 CLS
1000 RAND 0+USR 16514
1030 FOR I=2 TO 28
1040 LET L=5+5*RND
1050 PRINT AT L,I;
1060 FOR J=L TO 11+5*RND
1070 PRINT TAB I;"■"
1080 NEXT J
1090 NEXT I
1110 LET F=4
1130 LET Y1=3
1140 LET X0=0
1150 LET X1=20
1160 LET A$="■"
1170 FOR Z=1 TO 2
1180 LET Y0=5+20*RND
1190 GOSUB 10
1200 NEXT Z
1205 LET X0=3
1210 LET Y0=2
1215 LET X1=15
1220 LET Y1=25
1230 LET A$="..."
1240 LET F=.6
1250 GOSUB 10
1255 LET A$="■"
1260 LET F=.05
1265 GOSUB 10
1280 LET X0=INT (15*RND+1)
1290 LET Y0=20+RND+5
1300 FOR I=X0 TO X0+4+2*RND
1320 LET Y1=Y0+2*RND
1340 PRINT AT I,Y1;"■■■■■■■"( TO
2+4*RND)
1350 NEXT I
1360 NEXT Z
1380 LET HOLEX=INT (3+15*RND)
1390 PRINT AT HOLEX-2,0;
1400 FOR I=1 TO 5
1410 PRINT TAB 27;"     "
1420 NEXT I
1430 PRINT AT 0,13;"HOLE";HOLE;A
T HOLEX,29;"■"
1440 LET BALLX=10
1450 LET BALLY=2
1470 PRINT AT 0,0;YARDS;"YDS";TA
B 27;"PAR";PAR
1480 SLOW
1500 PRINT AT 10,2;"T";AT 10,2;"
■"
1510 IF INKEY$="" THEN GOTO 1500
1515 PRINT AT 21,0;K$;AT 21,0;"D
IRECTION(0-12)?"
1520 INPUT ANG
1525 IF ANG>12 THEN GOTO 1520
1530 LET ANG=ANG*P6
1540 PRINT AT 21,0;K$;AT 21,0;"S
TRENGTH(0-100)?"
1550 INPUT S
1560 PRINT AT 21,0;K$
1565 IF S>100 THEN LET S=100
1570 LET S=S*S1
1580 IF RUF THEN LET S=S/4
1590 PRINT AT BALLX,BALLY;O$
1600 LET SHOTS=SHOTS+1
1610 LET RUF=0
1620 LET BALLX=BALLX-S*COS ANG
1630 LET BALLY=BALLY+S*SIN ANG
1635 IF ABS (BALLX-10)<=10 AND A
BS (BALLY-15.5)<=15.5 THEN GOTO
1700
1640 IF BALLX<0 THEN LET BALLX=0
1650 IF BALLX>20 THEN LET BALLX=
20
1660 IF BALLY<0 THEN LET BALLY=0
1670 IF BALLY>31 THEN LET BALLY=
31
1675 LET SHOTS=SHOTS+1
1680 PRINT AT 21,0;"OUT OF BOUND
S-PENALTY SHOT"
1681 FOR I=1 TO 20
1682 NEXT I
1700 LET O$=CHR$ PEEK (INT (BALL
X+.5)*33+INT (BALLY+.5)+DFILE)
1705 IF O$="■" THEN GOTO 2100
1710 IF O$=" " THEN GOTO 2E3
1715 IF O$="■" THEN GOTO ROUGH
1720 IF O$="■" THEN GOTO LAKE
1725 IF O$="." THEN GOTO BUNKER
1730 IF O$="■" THEN GOTO TREES
1735 IF O$=" " THEN GOTO GREEN
2000 PRINT AT 0,22;INT SHOTS
2005 PRINT AT BALLX,BALLY;"B";AT
 BALLX,BALLY;"■"
2010 IF INKEY$="" THEN GOTO 2005
2020 GOTO 1515
2100 CLS
2103 LET PAR=INT (SHOTS-PAR)
2105 PRINT AT 4,12;"HOLE ";HOLE;
AT 6,0;"HOLED IT IN ";INT SHOTS;
"";
2107 IF NOT PAR THEN PRINT "; A
PAR; KEEP GOING"
2110 IF PAR=-1 THEN PRINT " A BI
TRDIE NOT BAD"
2112 IF PAR=-2 THEN PRINT "MY GO
D,...";"A GREAT BIG EAGLE","EXPE
RT STUFF"
2114 IF PAR=-3 THEN PRINT "AN AL
BATROSS";TAB 3;"THIS IS INCREDIB
LE STUFF"
2116 IF PAR>0 THEN PRINT "    ";P
AR;" OVER PAR"
2118 LET COURSE PAR=COURSE PAR+P
AR
2120 PRINT AT 12,6;" OVERALL"
2123 IF COURSE PAR THEN GOTO 213
0
2125 PRINT "ON PAR"
2127 GOTO 2140
2130 PRINT ABS INT COURSE PAR
2132 IF COURSE PAR<0 THEN PRINT
"UNDER PAR"
```

(continued on next page)

(continued from previous page)

```
2135 IF COURSE PAR>0 THEN PRINT
"OVER PAR"
2140 IF INKEY$="" THEN GOTO 2140
2150 GOTO 600
3000 PRINT AT 21,0;"ON THE GREEN
 IN ";INT (SHOTS);"
3010 GOTO 2E3
3500 PRINT AT 21,0;K$;AT 21,0;"B
UNKERED-A CHIP SHOT"
3510 LET SHOTS=INT (SHOTS+1)
3520 GOSUB 3600
3530 PRINT AT BALLX,BALLY;".";AT
 21,22;INT SHOTS
3540 LET BALLX=BALLY+3*RND-1
3550 LET BALLY=BALLY+2*RND
3560 LET O$=CHR$ PEEK (INT (BALL
X+.5)*33+INT (BALLY+.5)+DFILE)
3580 GOSUB 3600
3590 GOTO 1705
3600 FOR I=1 TO 10
3610 PRINT AT BALLX,BALLY;"B";AT
 BALLX,BALLY;"■"
3620 NEXT I
3630 RETURN
4000 PRINT AT 21,0;"IN THE TREES
-PENALTY SHOT"
4010 LET SHOTS=SHOTS+1
4020 GOTO 2E3
4500 PRINT AT 21,0;"IN THE LAKE
PENALTY SHOT"
4510 LET SHOTS=SHOTS+1
4520 GOTO 2E3
5000 PRINT AT 21,0;"IN THE ROUGH
-BETTER HACK IT"
5010 LET RUF=1
5020 GOTO 2E3
9000 REM "GOLF"
```

Dodgems

Olaf Morris,
Brussels,
Belgium.

VIC-20

DODGEMS IS A version for the Vic-20 of the well known game in which you control a car driving round a four-lane track. One can change lanes at four points on the circuit. To complicate things there is a rival car driving in the opposite direction. Its objective is to crash into you. It will change lanes rarely at first, but after 10 screens it will change just about whenever necessary.

The keys are as follows: A to change lanes leftwards; D to change lanes rightwards; W to change lanes upwards, and X to change lanes downwards.

```
2 POKE55,216:POKE56,29:CLR:POKE650,129:DIMEN(5),CA(5):HS=500
4 FORI=0TO39:READA:POKEI+7640,A:NEXT
6 DATA,102,255,129,129,255,102,,60,102,102,36,36,102,102,60,129,90,60,126
8 DATA78,44,90,129,,,60,36,36,60,,,,,36,24,24,36,,:POKE36869,255:L=.2:CO=2:LI=79
57:LV=1
10 POKE36879,110:PRINT"■";:FORI=1TO20:PRINT"■>>>>>>>>>>>>>>>>>>>>>>";:NEXT:POKE368
78,15
12 PRINT"■┌──────────┐|■■■■■■■   ■■■■■■■|■┌─────   ─────┐■|";
14 PRINT"|■|■■■■■■   ■■■■■■|■||■|■┌────   ────┐■|■||■|■■■■■   ■■■■■|■|■||■|■
■";
16 PRINT"┌──   ──┐■|■|■||■|■|■|■■   ■■|■|■|■||■|■|■|■┌────┐■|■|■|■|";
18 FORI=1TO4:PRINT"|        |    |         |";:NEXT:TI$="000000":L=L+.02:IFL>1THENL
=1
20 PRINT"|■|■|■|■└────┘■|■|■|■||■|■|■|■■   ■■|■|■|■||■|■|■└──    ";
22 PRINT"──┘■|■|■||■|■|■■■■   ■■■■|■|■||■|■└────   ────┘■|■||■|■■■■■■   ■■■■■
]|■|";
24 PRINT"|■└─────   ─────┘■||■■■■■■■   ■■■■■■■|└──────────┘■"
26 POKE36879,30:EN(1)=-1:EN(2)=-22:EN(3)=1:EN(4)=22:CA(1)=1:CA(2)=-22:CA(3)=-1:C
A(4)=22
28 DO=144:G$="■■■■■■■■■■■■■■■■■■■■■■"
30 EN(5)=4:CA(5)=4:EN=8130:CA=8132:E=1:F=1:PC=160:FORI=7953TOLI-1:POKEI,60:NEXT
32 POKECA,160:CA=CA+CA(E):IFCA=ENTHEN84
34 IFPEEK(CA)=62ORPEEK(CA)=160ORCA+CA(E)=ENTHENGOTO38
36 GOSUB74
38 X=60:IFE=1ORE=3THENX=59
40 IFPEEK(CA)=62THENGOSUB83:POKE36876,0:IFDO=0THENPOKECA,160:GOTO106
42 POKECA,X:GETA$
44 IFA$="W"ANDPEEK(CA-22)=160ANDE<>4ANDE<>2THENPOKECA,160:Y=-44:CA=CA+Y:GOSUB78
46 IFA$="X"ANDPEEK(CA+22)=160ANDE<>2ANDE<>4THENPOKECA,160:Y=44:CA=CA+Y:GOSUB78
48 IFA$="A"ANDPEEK(CA-1)=160ANDE<>1ANDE<>3THENPOKECA,160:Y=-2:CA=CA+Y:GOSUB78
50 IFA$="D"ANDPEEK(CA+1)=160ANDE<>3ANDE<>1THENPOKECA,160:Y=2:CA=CA+Y:GOSUB78
52 POKEEN,PC:EN=EN+EN(F):IFCA=ENTHEN84
54 IFPEEK(EN)=62ORPEEK(EN)=160THENGOTO58
56 GOSUB76
58 IFRND(1)>LTHENGOTO68
60 Z=EN((FAND3)+1):IFPEEK(EN+Z)=160ANDCA(5)<EN(5)THENEN=EN+Z*2:EN(5)=EN(5)-1:GOT
O68
62 Z=F-1:IFZ<1THENZ=4
64 Z=EN(Z)
66 IFPEEK(EN+Z)=160ANDCA(5)>EN(5)THENEN=EN+Z*2:EN(5)=EN(5)+1
68 X1=60:IFF=1ORF=3THENX1=59
70 PC=PEEK(EN):IFPC=XTHEN84
72 POKEEN,X1:GOSUB82:GOTO32
74 CA=CA-CA(E):E=E+1:E=(E-1AND3)+1:CA=CA+CA(E):RETURN
76 EN=EN-EN(F):F=F+1:F=(F-1AND3)+1:EN=EN+EN(F):RETURN
78 V=E+1:V=(V-1AND3)+1:IFCA(V)=Y/2THENCA(5)=CA(5)-1:RETURN
80 CA(5)=CA(5)+1:RETURN
82 FORI=0TO50:NEXT:RETURN
83 POKE36876,200:DO=DO-1:SC=SC+LV:PRINTG$;SC;"■■":RETURN
84 POKE36877,130:POKECA,61:GOSUB82:POKECA,62:GOSUB82:POKECA,63:LI=LI-1:POKE36877
,200
86 POKEEN,160:POKELI,160:POKE36877,0:IFLI>7953THEN30
88 CD=1:POKE36869,240:POKE36879,13:PRINT"■■■■■■":FORI=0TO10:PRINT"■";:FORJ=1TO8
90 POKE646,CD:CD=CD+1:IFCD=8THENCD=1
92 PRINT:PRINT"■■■■■■GAME  OVER";:NEXTJ,I
94 PRINT"■SCORE:";SC:PRINT"■■HI-SCORE:";HS:IFSC>HSTHENHS=SC:BD=1
96 IFBD=1THENBD=0:PRINT"■■YOU BEAT THE HI-SCORE.":PRINT"■■■■■■■■■■■■■■";HS
98 PRINT"■■■■■■■■■■■  ANOTHER GAME ?■"
100 GETA$:IFA$=""THEN100
102 IFA$<>"N"THENRUN8
104 END
106 BO=ABS(300*LV-LV*VAL(TI$)):LV=LV+1
108 POKE36869,240:PRINT"■■■■■WELL DONE !":PRINT"■■  ■BONUS:";BO
110 PRINT"■+ SCORE:";SC:PRINT"■■──────────────":PRINT"      ";BO+SC:FORI=0TO2000:NE
XT
112 SC=SC+BO:POKE36869,255:POKE646,CO:CO=CO+1:IFCO=8THENCO=2
114 GOTO10
```

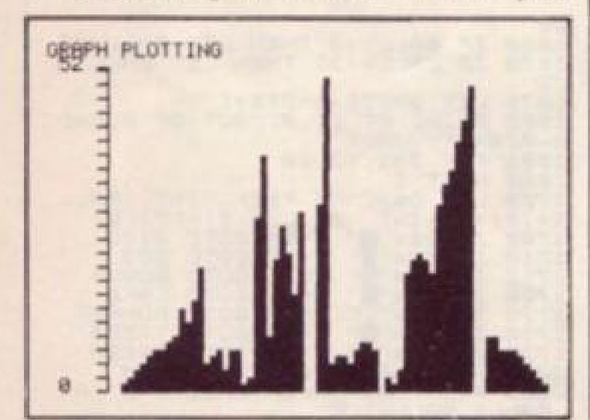
Pointing the way

David Rees,
Weybridge,
Surrey.

CBM-64

ONE DEFICIENCY OF the Commodore is that the basic machine has no command to plot points in any of the computer's many resolutions. Even printing needs a liberal sprinkling of control characters for characters to reach every part of the screen.

The following routine amends this in part.



The plotting resolution is low — 80×50 — but the machine code contains an entire command, with few inconveniences.

The first listing Pokes the machine code into part of the 4K RAM buffer at location 49152. As the command is self-sufficient, the listing is then no longer needed, and may be Newed. Thus, providing nothing else is stored in the first 300 bytes of the RAM buffer, none of your Basic memory is used.

The next thing to do is to understand and operate the command. To plot, it uses the graphic squares in the Commodore character set, allowing text to be displayed at the same time. All calculations are carried out in the code so using the command is easy.

To get data in, the routine uses three integer variables — X%, Y% and C% — so no Poking is necessary. The only disadvantage is that you must define these variables in the correct order, and before any others, as in the example program. X% and Y% give the X and Y positions of the pixel, starting from the top left-hand side of the screen. You need not worry if the position lies beyond any of the screen edges, as the command automatically ignores these points.

C% is a more versatile command variable. The first four bits — 0-15 — give the colour to be plotted, but bit four — switched on by adding 16 to the colour number — gives an Exclusive Or feature. This feature draws points so that if the place to be plotted at is blank a point appears, but if a point already exists a blank is drawn. Thus, to rub out a point you can simply draw and EORed point on top of it.

This is especially useful as the variables are never changed by the command, so you can draw a point and erase it quickly using very little program space. This variable setting principle is used in line 430 of the example program where, just by changing Y%, a column of points can be drawn at a rate of up

(continued on page 215)

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MODEL REFERENCE	1302-1 Medium Resolution	1302-2 High Resolution
RESOLUTION	370x470 Pixels	580x470 Pixels
C.R.T.	14"	14"
SUPPLY	220/240v. 50/60Hz.	220/240v. 50/60Hz.
E.H.T.	Minimum 19.5kv Maximum 22.5kv	Minimum 19.5kv Maximum 22.5kv
VIDEO BAND WIDTH	6MHz.	10MHz.
DISPLAY	80 characters by 25 lines	80 characters by 25 lines
SLOT PITCH	0.63mm	0.41mm
INPUT: VIDEO	R.G.B. Analogue/ TTL Input	R.G.B. Analogue/ TTL Input
SYNC	Separate Sync on R.G.B. Positive or Negative	Separate Sync on R.G.B. Positive or Negative
EXTERNAL CONTROLS	On/off switch and brightness control	On/off switch and brightness control

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I enclose a cheque for £______ Or please debit my credit card account with the amount of £______ My Access/Barclaycard (please tick) no. is ______

Please state the make of your computer ______

Name ______

Address ______

______

Telephone: ______

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Opus Supplies Ltd.

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to 50 points per second.

Another speed boost is given by the command name. The code is stored at byte 49152 and beyond, but by putting a machine code Goto statement at location 760, the computer takes less time to digest the address number written in Basic. The quicker point command is called SYS 760 — instead of 49152.

The second program listed — the demonstration routine — shows how to use the command and is useful in its own right. It contains a short routine which draws a 70-column bar chart using the data from line 1000 onwards, though it should be simple to adapt it for keyboard-data entry. The program is also self-scaling, so at least one column always reaches the top of the graph.

Finally, if you think 80×50 is too low a resolution to look effective, I have included a graph printout that might be impressive enough to change your mind.

```
991 REM* POINT CODE ROUTINE *
996 REM*X%=X POS : Y%=Y POS *
997 REM*   C%=COLOUR AND    *
998 REM*  OR/EOR FUNCTION   *
999 REM**********************
1000 FORN=0TO214
1010 READA:POKE49152+N,A
1020 NEXTN
1030 FORN=0TO15
1040 READA:POKE49408+N,A
1050 NEXTN
1100 POKE760,76:POKE761,0:POKE762,192
1500 DATA160,2,177,45,201,,240,1,96,200
1510 DATA177,45,141,52,3,56,233,80
1515 DATA144,2,24,96,160,9,177,45
1520 DATA201,,240,1,96,200,177,45
1530 DATA141,53,3,56,233,50
1535 DATA144,2,24,96,160,17,177,45
1540 DATA141,54,3,41,16,141,55,3
1550 DATA173,52,3,24,74,24,141,56,3,10
1560 DATA24,141,57,3,173,52,3,56
1570 DATA237,57,3,24,141,60,3,173,53,3
1580 DATA24,74,24,141,58,3,10,24
1590 DATA141,59,3,173,53,3,56,237,59,3
1600 DATA24,10,24,141,61,3,24,109,60,3
1610 DATA24,168,169,1,192,,240,8,24,10
1620 DATA24,136,192,,208,248,141,62,3
1630 DATA169,4,133,252
1640 DATA173,56,3,172,58,3,192,,240,13
1650 DATA24,105,40,144,3,24,230,252,136
1660 DATA192,,208,243,133,251,160,
1670 DATA177,251,217,,193,240,7,200
1680 DATA192,16,208,246,160,,152
1690 DATA172,55,3,192,,208,6,13,62,3
1700 DATA24,144,3,77,62,3,168,185,,193
1710 DATA160,,145,251,165,252,24
1720 DATA105,212,24,133,252,173,54,3
1730 DATA145,251,96
1800 DATA32,126,124,226,123,97,255,236
1810 DATA108,127,225,251,98,252,254,160
```

```
6 REM*BAR CHART PLOTTER*
7 REM*  BY DAVID REES   *
8 REM*  DEMONSTRATION   *
9 REM* OF POINT COMMAND*
10 X%=0:Y%=0:C%=5
20 V=53248:DIMD(69):DIMS(69)
99 REM*[CLS]
100 PRINT"J"
200 FORN=0TO69:READD(N):NEXT
210 M=0
220 FORN=0TO69
230 IFD(N)>MTHENM=D(N)
240 NEXTN
250 FORN=0TO69
260 S(N)=50-INT(D(N)*45/M)
270 NEXTN
299 REM*[CLS]
300 PRINT"JGRAPH PLOTTING"
310 POKEV+32,0:POKEV+33,6
319 REM*[UP][RIGHT*4]
320 PRINTM:PRINT"DDDDL"
330 FORN=0TO21:PRINT"     J":NEXTN
339 REM*..[HOME]
340 PRINT" 0  JM"
400 FORN=0TO69
410 X%=N+10
420 IFS(N)=50THEN440
430 FORM=49TOS(N)STEP-1:Y%=M:SYS760:NEXTM
440 NEXTN
450 GETA$:IFA$=""THEN450
459 REM*[CLS]
460 PRINT"J"
470 END
999 REM*DATA FOR BAR CHART*
1000 DATA0,1,2,3,4,5,6,7,8,9,10
1010 DATA0,2,4,6,8,10,12,14,16,18,20
1020 DATA40,10,22,28,24,17,31,0,0,32,52
1030 DATA0,1,2,3,5,6,7,9,11,13,15,17,20
1040 DATA22,24,27,29,32,35,38,42,46,51
1050 DATA1,1,10,10,7,8,7,6,5,4,3,2,1,0
```

Mower

Shingo Sugiura,
Putney,
London.

ORIC

THIS GAME WAS originally written for a BBC model B — April 1983, *Your Computer.* Now I have converted it to run on the Oric 48K. The original game had background music continuously ringing during the game but I am afraid I had to leave this feature out of the conversion.

Having failed all your O levels, you could only get a job as a lawn mower but the garden you mow is not a normal garden. It is littered with rocks which will crunch up your mower. The garden is enclosed in an electric fence and your mower is peculiar in that if the fuel runs out it blows up. If you lose three mowers you are fired.

You have to control your mower around the garden avoiding the rocks and the fence, gobbling up fuel cans. The difficulty lies in the fact that if you mow over an area already mowed your oil will decrease but your score will stay the same and you know what happens if your oil runs out. So the trick is to avoid areas already mowed as much as possible. Once you have mowed a certain percentage of the garden you will go on to another garden with more rocks.

Note when typing in this program that some of the characters in the listing are not directly accessible from the keyboard. This is because not all the characters on my printer are the same as that of the Oric's but share the same ASCII code. They are the following:

Line 100 a copyright sign CHR$(96)
Line 390 a pound sign CHR$(95)
Line 680 a pound sign CHR$(95)

Line 30 .... Sets up score, screen and lives.
Line 40 .... Calls routine to set up the screen.
Lines 60 to 90 .... Scans keyboard.
Line 100 .... Rubs out the mower.
Lines 100 to 140 .. Updates mower position.
Line 150 .... Sees what is in front of the mower.
Line 160 .... If it is not a space, go to a checking routine.
Line 170 .... Updates score and oil.
Line 180 .... Calls a routine to print the mower.
Lines 190 to 210 .. Takes appropriate action if dead.
Lines 300 to 392 .. Sets up the screen.
Lines 400 to 430 .. Initialises variables.
Lines 500 to 720 .. Instructions.
Lines 1300 to 1410 Defines characters.
Lines 1500 to 1530 Routine to print out the mower.
Line 1540 .... Prints score.
Line 1550 .... Prints oil left.
Lines 2000 to 2030 Checks what is in front and takes appropriate action.
Lines 2100 to 2160 Routine called when one mower dead.
Lines 2200 to 2220 New screen.
Lines 2300 to 2340 Routine called when three mowers are dead.

Variables.

SC	Score.
LE%	Screen.
LI%	Mowers left.
K$	Key pressed.
X%,Y%	Co-ordinates of mower.
A$	Direction.
CH%	ASCII code of character in front of the mower.
OIL	Fuel of mower.
DIE	A flag.

```
5 REM LAWN MOWER
10 TEXT:GRAB:HIMEM#B400
20 GOSUB1300:HI%=0:CLS:GOSUB500
30 SC=0:LE%=1:LI%=2
40 CLS:PAPER2:INK4:GOSUB300
50 REPEAT:K$=KEY$
60 IF K$="Z" THEN A$="LEFT"
70 IF K$="X" THEN A$="RIGHT"
80 IF K$="'" THEN A$="UP"
90 IF K$="/" THEN A$="DOWN"
100 PLOTX%,Y%,"`":REM COPYRIGHT CHARACTER
110 IF A$="LEFT" THEN X%=X%-1
120 IF A$="RIGHT" THEN X%=X%+1
130 IF A$="UP" THEN Y%=Y%-1
140 IF A$="DOWN" THEN Y%=Y%+1
150 CH%=SCRN(X%,Y%)
160 IF CH%<>32 THEN GOSUB2000
170 SC=SC+0.1:OIL=OIL-0.1
180 GOSUB1500
181 IF OIL<0 THEN DIE=TRUE
190 UNTIL DIE OR SC>46*LE%
200 IF DIE THEN GOSUB 2100:GOTO V
210 IF SC>46*LE% THEN GOSUB 2200:GOTO40
299 REM SET UP THE SCREEN
300 PLOT0,0,CHR$(1):PLOT14,0,"<<MOWER>>"
310 FORA=2TO36:PLOTA,2,"!":PLOTA,23,"!":NEXTA
320 FORA=3TO22:PLOT2,A,"!":PLOT36,A,"!":NEXTA
330 PLOT0,24,CHR$(5):PLOT2,24,"OIL":PLOT25,24,"SCORE"
340 PLOT0,25,CHR$(0):PLOT2,25,"MOWERS LEFT":PLOT25,25,"SCREEN"
341 M$=RIGHT$(STR$(LI%),LEN(STR$(LI%))-1):PLOT14,25,M$
```

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```
350 LE$=RIGHT$(STR$(LE%),LEN(STR$(LE%))-1):PLOT31,25,LE$
360 FOR OB=1 TO LE%*4+6:X=RND(1)*33+3:Y=RND(1)*18+3
370 PLOTX,Y,"@":NEXT OB:REM CHR$(64)
380 FOR FU=1TOLE%*4+6:X=RND(1)*33+3:Y=RND(1)*18+3
390 PLOTX,Y,"_":NEXT FU:REM POUND SIGN
391 PLOT2,26,"HI-SCORE:":H$=RIGHT$(STR$(HI%),LEN(STR$(HI%))-1)
392 PLOT11,26,H$:PLOTO,26,CHR$(7)
400 REM INITIALISE
410 A$="RIGHT":X%=15:Y%=15:OIL=40
420 DIE=FALSE
430 RETURN
499 REM INSTRUCTIONS
500 PRINT:PRINTCHR$(4);SPC(15)"MOWER":PRINTCHR$(4)
510 PLOT1,1,10:PLOT1,2,10
520 PRINT:PRINTSPC(10)"BY SHINGO SUGIURA":PLOTO,4,CHR$(1)
610 PRINT:PRINT"CONTROLS'
620 PRINT:PRINT"'Z' --- left   'X' --- right"
630 PRINT"''' --- up   '/' --- down"
660 PRINT:PRINT"@ --- rock..   # --- mower.."
680 PRINT"_ --- fuel cans.."
700 PRINT:PRINTCHR$(140)SPC(7)"Press SPACE BAR to play"
710 REPEAT:UNTIL KEY$=" "
720 RETURN
1299 DEFINE CHARACTERS
1300 FORA=46344TO46351:READB:POKEA,B:NEXTA
1310 DATA63,46,63,29,63,46,63,29
1320 FORA=46360TO46391:READB:POKEA,B:NEXTA
1330 DATA63,33,63,33,63,12,12,30
1340 DATA30,12,12,63,33,63,33,63
1350 DATA7,5,37,61,61,37,5,7
1360 DATA56,40,41,47,47,41,40,56
1370 FORA=46592TO46599:READB:POKEA,B:NEXTA
1380 DATA12,30,30,31,15,61,61,63
1390 FORA=46840TO46855:READB:POKEA,B:NEXTA
1400 DATA12,18,33,63,30,30,30,30
1410 DATA62,47,59,63,55,61,59,31
1420 POKE#26A,10
1430 RETURN
1500 IF A$="LEFT" THEN PLOTX%,Y%,"&"
1510 IF A$="RIGHT" THEN PLOTX%,Y%,"%"
1520 IF A$="DOWN" THEN PLOTX%,Y%,"$"
1530 IF A$="UP" THEN PLOTX%,Y%,"#"
1540 S$=RIGHT$(STR$(INT(SC)),LEN(STR$(INT(SC)))-1):PLOT32,24,S$
1550 FU$=RIGHT$(STR$(INT(OIL)),LEN(STR$(INT(OIL)))-1)
1555 PLOT6,24,FU$+" "
1560 RETURN
1999 REM CHECK WHAT IS IN FRONT OF THE MOTOR
2000 IF CH%=95 THEN OIL=OIL+2:ZAP
2010 IF CH%=96 THEN SC=SC-0.1:OIL=OIL-0.2
2020 IF CH%=64 OR CH%=33 THEN DIE=TRUE:EXPLODE
2030 RETURN
2099 REM DIE
2100 LI%=LI%-1
2110 PLOT6,24,"0"
2120 IFOIL>=0 THEN GOTO 2130
2125 PLAY1,0,2,1000:FORA=12TOSTEP-1:MUSIC1,3,A,10:WAIT3:NEXT
2130 PLAY0,0,0,0
2140 WAIT300
2150 IF LI%<0 THEN GOSUB2300:V=30:RETURN
2160 V=40:RETURN
2199 REM NEW SCREEN
2200 PLOT10,10,"SCREEN "+LE$+" MOWED":PLOT9,10,CHR$(1)
2205 PLOT25,10,CHR$(4)
2210 FORA=1TO12:MUSIC1,3,A,10:WAIT20:NEXT:PLAY0,0,0,0
2220 LE%=LE%+1:RETURN
2230 PLAY1,0,2,1000
2235 FORA=12TO1STEP-1:MUSIC1,3,A,10:WAIT20:NEXTA
2299 REM DEATH
2300 PLAY1,0,2,1000:FORA=12TO1STEP-1
2305 MUSIC1,3,A,10:WAIT20:NEXTA
2310 PLAY0,0,0,0:IF SC>HI% THEN HI%=SC
2320 PRINT:PRINT"Press SPACE BAR to play"
2330 REPEAT:UNTIL KEY$=" "
2340 RETURN
```

Life-cycle

C Maitland, Hammersmith, London.

BBC

PART OF THE fascination exerted by John Conway's game, Life, lies in the way it appears to simulate a natural process — the life-cycle of a colony of cells or, perhaps, a population. Narrow your eyes when you look at the display and you can imagine that a colony of amoebas is loose in the cathode ray tube.

For the best animation effects a Life program should be fast. This version for the BBC models A and B is exceptionally quick and can handle up to 10 generations a second. It uses Mode 7 to plot the cells on a 40 by 25 grid. It treats cells along the opposite edges as adjacent so that a cluster of cells moving to the top will reappear at the bottom.

The program offers you the option of setting up the initial display yourself or taking a randomly generated display. There is also a choice of speed.

For those who are unfamiliar with the game here is a short explanation: Life generates patterns by applying a few simples rules to an array of cells. Each cell occupies a character space bounded by eight other spaces. If a cell has two or three neighbours it survives to the next generation, otherwise it dies. If an empty space is bounded by exactly three cells a new cell is born.

```
10 *KEY1 GOTO 730|M
20 REM PRESS ESCAPE TO STOP
30 REM PRESS F1 TO RESTART
40 ARL=&70:ARH=&71:?ARL=0:?ARH=&30
50 DPL=&72:DPH=&73:?DPL=&D7:?DPH=&2F
60 SCL=&74:SCH=&75:?SCL=HIMEM MOD 256:?SCH=HIMEM DI
V 256
70 TEMP=&76
80 CHAR=ASC"O":REM CELL CHARACTER
90 REM CHANGE THIS FOR CHARACTER OF YOUR CHOICE
100 DIM START 250
110 FOR I%=0 TO 2 STEP2:P%=START
120 [OPT I%
130 JSR FILL:JSR LIFE
140 RTS
150.FILL LDX#3:LDY#0
160 .LOOP
170 LDA(SCL),Y:STA(ARL),Y
180 INY:BNE LOOP
190 INC SCH:INC ARH:DEX:BNE LOOP
200 .LL1 LDA(SCL),Y:STA(ARL),Y:INY:CPY#232:BNE LL1
210 LDA#HIMEM DIV 256:STA SCH:LDA#&30:STA ARH
220 LDX#41
230 .LL2 LDA &33BF,X:STA &2FD7,X
240 LDA &2FFF,X:STA &33E7,X
250 DEX
260 BNE LL2
270 RTS
280.COMP STX TEMP:LDX#0
290 LDY #0:LDA(DPL),Y
300 CMP #32:BEQ LL3:INX
310 .LL3 LDY #1:LDA(DPL),Y
320 CMP #32:BEQ LL4:INX
330 .LL4 LDY #2:LDA(DPL),Y
340 CMP #32:BEQ LL5:INX
350 .LL5 LDY #40:LDA(DPL),Y
360 CMP #32:BEQ LL6:INX
370 .LL6 LDY #42:LDA(DPL),Y
380 CMP #32:BEQ LL7:INX
390 .LL7 LDY #80:LDA(DPL),Y
400 CMP #32:BEQ LL8:INX
410 .LL8 LDY #81:LDA(DPL),Y
420 CMP#32:BEQ LB1:INX
430 .LB1 LDY #82:LDA(DPL),Y
440 CMP #32:BEQ LB2:INX
450 .LB2 CPX #2:BEQ LB4
460 CPX #3:BNE LB3
470 LDA #CHAR:LDY#0:STA(SCL),Y
480 LDX TEMP:RTS
490 .LB3 LDA#32:LDY#0:STA(SCL),Y
500 .LB4 LDX TEMP:RTS
510 .LIFE LDX#3
520 .LB5 JSR COMP
530 INC DPL:LDA#0:CMP DPL:BNE LB6
540 INC DPH
550 .LB6 INC SCL:INC ARL
560 LDA#0:CMP SCL:BNE LB5
570 INC SCH:INC ARH:DEX:BNE LB5
580 .LB7 JSR COMP
590 INC DPL:LDA#0:CMP DPL:BNE LB8
600 INC DPH
610 .LB8 INC SCL:INC ARL
620 LDA#232:CMP ARL
630 BNE LB7
640 LDA#0:STA SCL:STA ARL
650 LDA#HIMEM DIV 256:STA SCH
660 LDA#&30:STA ARH
670 LDA#&D7:STA DPL
680 LDA#&2F:STA DPH
690 RTS
700 ] NEXT
710 CLS:*FX15,1
720 PRINT "              SELECT SPEED"
730 PRINT'"       - GENERATIONS PER SECOND"
740 PRINT''"  A. 10"
750 PRINT"  B. 8"
760 PRINT"  C. 6"
770 PRINT"  D. 4"
780 PRINT"  E. 2"
790 PRINT"  F. 1"
800 A$=GET$
810 IF A$="A" THEN S%=10
820 IF A$="B" THEN S%=130
830 IF A$="C" THEN S%=350
840 IF A$="D" THEN S%=750
850 IF A$="E" THEN S%=2000
860 IF A$="F" THEN S%=4500
```

(continued on next page)

(continued from previous page)

```
870 CLS
880 PRINT "     DO YOU WANT TO"
890 PRINT "      SET UP THE SCREEN?"
900 PRINT'"     Y/N?"
910 A$=GET$:IF A$="N" THEN CLS:GOTO 1020
920 PRINT'"USE Z AND X FOR LEFT AND";
930 PRINT"RIGHT"
940 PRINT"USE : AND / FOR UP AND DOWN"
950 PRINT"USE SPACE BAR TO ENTER"
960 PRINT"USE E FOR ERASE"
970 PRINT" PRESS RETURN WHEN YOU";     980 PRINT" HAV
E FINISHED"
980 PRINT" HAVE FINISHED"
990 PRINT''"PRESS ANY KEY TO START"
1000 D=GET:MODE7
1010 PROCCURS:GOTO 1030
1020 FOR N=0 TO 250:?(HIMEM+RND(998))=CHAR:NEXT
1030 VDU 23;10,32,0;0;0;
1040 REPEAT
1050 CALL START
1060 FOR N%=1 TO S%:NEXT
1070 UNTIL FALSE
1080 DEFPROCCURS
1090 REPEAT
1100 A=GET
1110 IF A=32 THEN PRINT"O";:VDU8
1120 IF A=90 THEN VDU8
1130 IF A=88 THEN VDU9
1140 IF A=58 THEN VDU11
1150 IF A=47 THEN VDU10
1160 IF A=69 THEN PRINT" ";:VDU8
1170 UNTIL A=13
1180 ENDPROC
```

Bridge-builder

S Powell,
Honiton,
Devon.

SPECTRUM

DROPPING STEEL SECTIONS by helicopter may not be the usual way of constructing a bridge, but it is the method used in this game.

Type in listing 1 — the graphics loader and run it. This sets up the user-defined graphics. Type New and then type in listing 2 — the main program. Save this on tape by Goto 9998 — it is saved in two parts, program and bytes. You can now Run the program.

It will start by showing a list of the highest scores, and after a while, will give a demonstration. To start a game, press Space.

The game begins by showing an unfinished bridge with a man on it and a helicopter flying above. Unfortunately, the man is blind, and he walks slowly forward while the bridge is built. Use the Space key to drop a section of bridge from the helicopter. You must drop it next to the end of the left-hand section of the bridge, to make it longer. If you miss, then the blind man will walk off the edge and fall in the river.

Fortunately, there are three lifebelts with which to save him but the fourth time he falls in, he drowns. When you have completed a bridge, you get a 50-point bonus and another bridge to build. If you get one of the ten best scores, you can enter your name. Use the right and left arrow keys to select the correct letter, then press 0. Press enter when you have entered your name.

Listing 1.

```
   1 REM   User graphics set-up
9900 FOR z=USR "a" TO USR "u"+7:
 READ x: POKE z,x: NEXT z
9902 DATA 127,2,31,55,103,103,63
,31
9904 DATA 240,1,131,255,255,240,
224,192
9906 DATA 0,0,15,28,63,63,63,12
9908 DATA 255,138,140,136,240,16
0,192,128
9910 DATA 255,136,x,x,255,136,x,
x
9912 DATA 255,x,x,x,153,189,219,
153
9914 DATA 0,x,128,192,252,x,x,48
9916 DATA 153,24,24,28,22,18,226
,131
9918 DATA 0,x,60,90,126,24,60,21
8
9920 DATA 24,x,x,x,60,102,195,12
9
9922 DATA 0,x,60,90,126,153,126,
24
9924 DATA 195,231,255,x,x,x,x,x
9926 DATA 15,63,124,224,x,124,63
,15
9928 DATA 255,x,0,x,x,x,255,x
9930 DATA 240,252,62,7,7,62,252,
240
9932 DATA 52,44,36,36,52,44,36,3
6
9934 DATA 60,90,126,24,60,218,25
5,x
9936 DATA 121,103,97,97,121,102,
96,x
9938 DATA 224,x,240,x,248,252,25
4,255
9940 DATA 7,7,15,15,31,63,127,25
5
9942 DATA 255,72,40,16,7,4,2,1
```

Listing 2.

```
  0>REM BRIDGE BUILDER

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______________________________
   1 GO TO 4
   2 IF INKEY$=" " THEN GO TO 9
   3 RETURN
   4 DIM h(10): DIM h$(10,10): B
ORDER 1: POKE 23693,56: CLS
   5 FOR z=1 TO 10: LET h$(z)="n
obody": NEXT z
   7 GO TO 4000
   9 LET dm=0: POKE 23624,141: B
EEP .3,-10: BEEP .1,-3: INPUT AT
 0,0;"Skill level? (1-10) 10 = H
ard";"?";k: BORDER 1
  10 IF NOT dm THEN PAPER 5: CLS
: PRINT AT 10,0; INK 0;"<SPACE>
 = DROP SECTION OF BRIDGE"
  11 FOR x=1 TO 10: FOR z=x TO x
+50 STEP 10: BEEP .01,z: NEXT z:
 NEXT x: BORDER 0: PAPER 6: INK
0: CLS
  12 IF dm THEN LET k=0: PRINT #
0; INK 5;"DEMO - "; INK 4;"Press
 space to start"
  14 IF NOT dm THEN PRINT #0; PA
PER 1; INK 6;"Skill level: ";k;,
: LET k=11-k
  40 PRINT AT 0,0; PAPER 3; INK
7;" BRIDGE    SCORE 0      HIGH ";
h(1),
  50 FOR z=21 TO 18 STEP -1: PRI
NT AT z,0; PAPER 1,,: NEXT z: PR
INT AT 17,0; INK 1;"LL"; PAPER 1
;"■"; PAPER 6;"LLLLLLLLLLLLLLLL
LLLLLLLLL"; PAPER 1;" "; PAPER 6
;"LL"
  60 FOR z=6 TO 2 STEP -1: PRINT
 AT 15+z,0; PAPER 4;TAB z; INVER
SE 0; PAPER 8; INK 4;"S";AT 15+z
,31-z;"T"; PAPER 4,: NEXT z
  70 FOR z=0 TO 4: PRINT PAPER 8
;AT 18-z,0;"EEEEEEE"( TO z);"D";
AT 18-z,31-z;"U";"EEEEEEE"( TO z
): NEXT z
  75 PRINT PAPER 7; BRIGHT 1; IN
K 0;AT 13,0;"FFFFFF";AT 13,26;"F
FFFFF"
  76 FOR z=3 TO 7 STEP 2: PRINT
AT z,27; INK 2;"MNO": NEXT z
  78 FOR z=2 TO 8: PRINT OVER 1;
AT z,26; INK 2; PAPER 4;"     "
 NEXT z
  80 LET n=5: LET s=0
  81 LET LV=3
  82 FOR z=1 TO n-1: PRINT AT 11
,z;" I";AT 12,z;" H": NEXT z
  83 IF n=25 THEN GO TO 1000
  84 LET D=1: LET H=0
  85 INK 0
 100 FOR a=29 TO 0 STEP -1
 110 PRINT AT 10,a;"AB "
 119 FOR j=1 TO k
 120 IF D=1 THEN IF INKEY$=" " T
HEN GO TO 200
 121 NEXT j
 122 IF dm THEN GO SUB 2: IF a=n
 THEN IF RND>.1 THEN GO SUB 200
 130 NEXT a
 135 PRINT AT 10,0;"  "
 137 IF H=N THEN PRINT AT 11,N;"
 I";AT 12,N;" H": LET N=N+1: LET
 s=s+INT ((11-k)/2)+(k=10): PRIN
T AT 0,16; PAPER 3; INK 7;s: GO
TO 83
 140 GO TO 300
 190 STOP
 200 LET D=0: IF A<>N THEN LET L
=16
 210 IF A=N THEN LET L=13
 220 IF A<N OR A>24 THEN LET L=1
2
 250 FOR Z=12 TO L
 260 PRINT AT Z,A+1;"F";AT Z-1,A
+1;" "
 270 NEXT Z: PRINT AT L,a+1; PAP
ER 7;"F"
 275 IF A<>N AND (A>N AND A<25)
THEN PRINT AT Z-1,A+1;" "
 276 LET H=A
 280 GO TO 130
 320 PRINT AT 11,N;" ";AT 12,N;"
 ";AT 11,N+1;"I";AT 12,N+1;"H"
 340 FOR Z=1 TO 5
 355 BEEP .1,50: PRINT AT 11,N+1
;"I";AT 12,N+1;"H"
 357 BEEP .1,0: PRINT AT 11,N+1;
"K";AT 12,N+1;"J"
 360 NEXT Z
 370 FOR Z=10 TO 15: PRINT AT Z,
N+1;"K";AT Z+1,N+1;"J";AT Z-1,N+
1;" "
 375 NEXT Z
 378 PRINT AT 15,N+1;" ";AT 16,N
+1;"K"
 380 PRINT AT 15,N+2;"HELP!": FO
R Z=1 TO 5: PRINT AT 16,N+1;"I":
 BEEP .1,0: PRINT AT 16,N+1;"K":
 BEEP .1,10: NEXT Z
 385 LET LV=LV-1
 386 IF lv=-1 THEN GO TO 2000
 387 GO SUB 900
 390 PRINT INK 2; PAPER 6; FLASH
 1;AT 10,8;LV;" LIFE-BELT";"S" A
ND lv<>1;" LEFT"
 395 FOR X=1 TO 10: FOR Z=X TO X
+50 STEP 10: BEEP .01,Z: NEXT Z:
 NEXT X
 397 PRINT AT 10,8,,AT 15,N+2;"
     ";AT 16,N+1;" "
 398 FOR z=0 TO 4: PRINT PAPER 8
;AT 18-z,31-z;"U";"EEEEEEE"( TO
z): NEXT z: PRINT PAPER 7; BRIGH
T 1; INK 0;AT 13,26;"FFFFFF"
 399 GO TO 82
 900 INK 2: LET d=3+(lv*2)
 905 PRINT AT 15,n+1;"      "
 910 FOR z=27 TO n+1 STEP -1
 920 PRINT PAPER 8;AT d,z; INK 2
;"MNO "
 925 BEEP .01,z
 930 NEXT z
 935 FOR z=d TO 1 STEP -1: PRINT
 AT z,n+1;" P": NEXT z
 940 FOR z=d TO 16
 950 PRINT AT z,n+1;"MNO";AT z-1
,n+1;" P "
 955 BEEP .01,z
 960 NEXT z
 965 FOR z=15 TO 1 STEP -1
 967 PRINT AT z,n+1;"MOO";AT z+1
,n+1;"   "
 968 BEEP .01,z
 969 NEXT z: FOR z=n+1 TO 0 STEP
 -1: PRINT AT 1,z;"MOO ": NEXT z
 970 FOR z=2 TO 12: PRINT AT z,0
;"MOO";AT z-1,0;" P ": BEEP .01,
z: NEXT z
 980 PRINT AT 11,0; INK 0;" I ";
" H ": FOR z=9 TO 1 STEP -1: PRI
NT AT z,0;"MNO";"   ": NEXT z
 985 PRINT AT 1,0;"   "
 999 INK 0: RETURN
1000 FOR z=25 TO 30: PRINT AT 11
,z;" I";AT 12,z;" H": BEEP .01,z
: NEXT z
1001 INK 1: PRINT AT 11,31;" ";A
T 12,31;" "
1010 FOR z=0 TO 29: BEEP .001,33
: PRINT INK 1;AT 12,z;"50 points
 for completing Bridge"(z+1);"CG
": NEXT z
1020 PRINT AT 12,29;"9e "
1030 PRINT FLASH 1;AT 12,0; OVER
 1; INK 8,,: FOR z=1 TO 50: LET
s=s+1: PRINT FLASH 1; PAPER 1; I
NK 7;AT 0,16;s: BEEP .01,z: NEXT
 z: PRINT PAPER 3; INK 7;AT 0,16
;s
1040 PRINT AT 12,0,,: PRINT AT 1
3,6,TAB 26,
1100 LET n=5: GO TO 82
3000 LET n=n+1: FOR z=17 TO 20
3010 PRINT AT z-2,n+1; PAPER z-1
6; INK 7;"GLUG!!"; PAPER 8;AT z-
1,n;" ";AT z,n;"I";AT z+1,n;"J":
 BEEP .1,22-z
3015 PRINT PAPER 1;AT z,n; INK 7
;"K": BEEP .1,21-z
3020 NEXT z
3030 BEEP .1,48: BEEP .1,36: BEE
P .1,24: BEEP 1,12: BEEP .2,0
3040 PRINT AT 20,n; PAPER 1; INK
 7;"I"
```

(continued on page 223)

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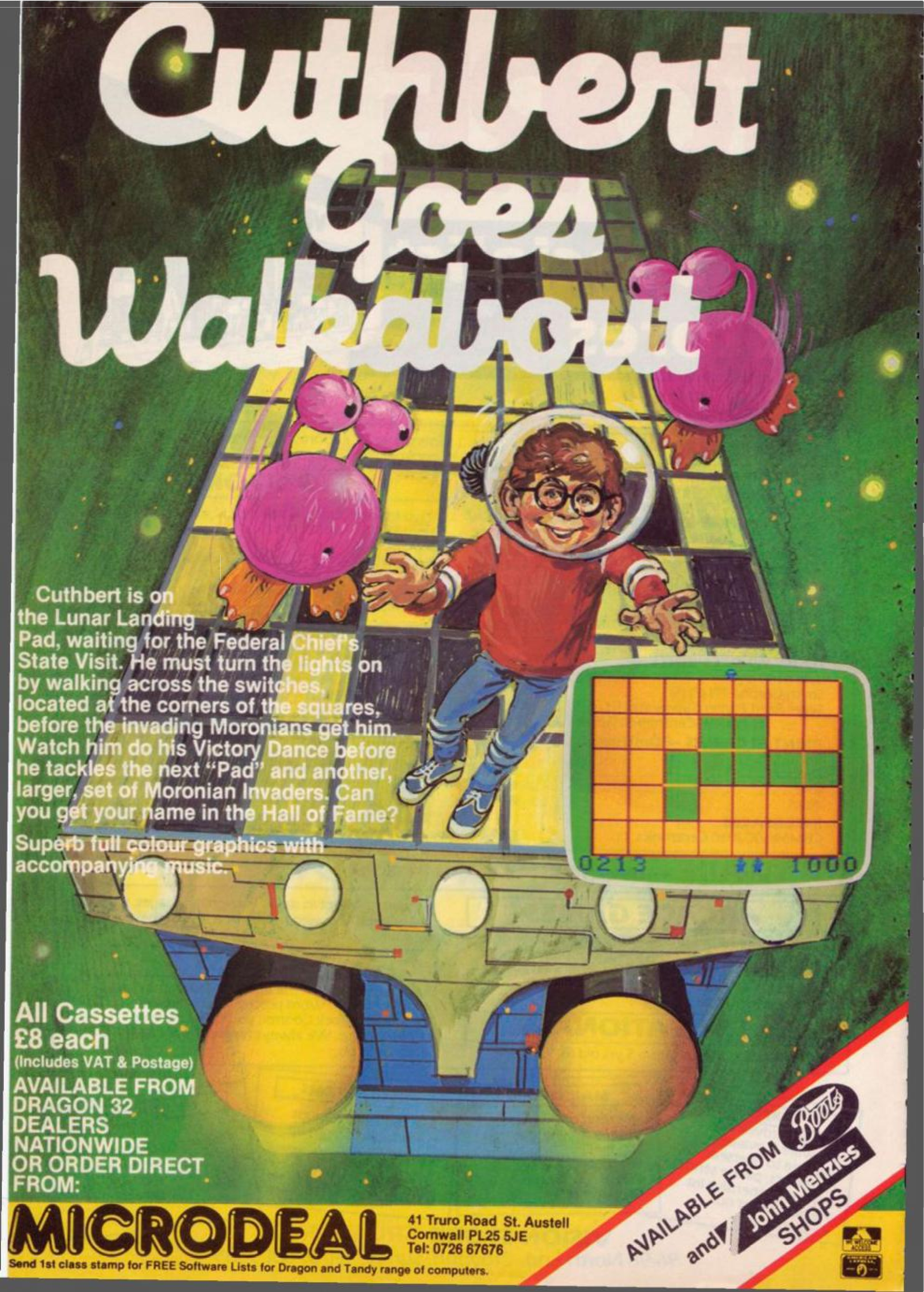
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(continued from page 218)

```
3050 PRINT AT 10,11; INK 1;"GAME
 OVER";AT 10,11;"DEMO" AND d
3060 FOR z=1 TO 300: NEXT z
3070 CLS
3080 IF d THEN GO TO 4000
3100 FOR z=1 TO 10
3110 IF s<=h(z) THEN NEXT z: GO
TO 4000
3120 PRINT "YOU HAVE GOT ONE OF
TODAY'S"''" HIGHEST SCORES. PLEA
SE ENTER"''" YOUR NAME."
3135 LET c=21: LET z$=" ?ABCDEFG
HIJKLMNOPQRSTUVWXYZ',-+*="
3137 LET h$(10)="": LET z$=z$+z$
: PRINT AT 11,16;"↑";AT 10,16; P
APER 4;" "; PAPER 7;AT 15,10;"""

3140 FOR z=1 TO 10
3142 PRINT AT 15,10+z; PAPER 7;
INK 5; FLASH 1;" "
3160 PRINT AT 10,0; PAPER 6;z$(c
 TO c+31)
3170 PAUSE 0: LET c=c+(INKEY$="8
")-(INKEY$="5"): IF c>34 THEN LE
T c=1
3172 IF c<1 THEN LET c=34
3173 IF INKEY$=CHR$ 13 THEN GO T
O 3190
3175 IF INKEY$="0" THEN LET h$(1
0,z)=z$(c+16): PRINT PAPER 7;AT
15,11;h$(10): FOR x=1 TO 50 STEP
 10: BEEP .01,x: NEXT x: NEXT z:
 GO TO 3190
3180 GO TO 3160
3190 LET h(10)=s: PRINT AT 15,11
; FLASH 1; INK 2; PAPER 6;h$(10)
3200 LET f=0
3210 FOR z=1 TO 9
3215 BEEP .005,z
3220 IF h(z)<h(z+1) THEN LET t=h
(z+1): LET h(z+1)=h(z): LET h(z)
=t: LET a$=h$(z+1): LET h$(z+1)=
h$(z): LET h$(z)=a$: LET f=1
3230 NEXT z
3240 IF f=1 THEN GO TO 3200
4000 CLS : PRINT INK 0;"R  R  R
 R  R  R  R  R  R  R  "; PAPER
 1; INK 7;"     TODAY'S HIGHEST
SCORES","     ON BRIDGE BUILDE
R"
4010 FOR z=1 TO 10: PRINT AT z+4
,5;h(z);TAB 18;h$(z): NEXT z
4020 PRINT AT 17,7;"© 1983 Simon
 Powell";AT 20,5; FLASH 1; INK 2
;"PRESS (SPACE) TO START"
4030 FOR o=1 TO 5: FOR z=1 TO 7
4040 FOR x=1 TO 10: PRINT AT x+4
,5; PAPER z; INK 9; OVER 1;TAB 2
9;: IF INKEY$=" " THEN GO TO 9
4050 NEXT x: NEXT z: NEXT o
4070 LET d=1: GO TO 10
9998 SAVE "BRIDGE" LINE 9999: SA
VE "udg"CODE USR "a",21*8
9999 LOAD ""CODE USR "a": RUN
```

64 function key

Mark Tingle,
Harlow,
Essex.

CBM-64

THIS PROGRAM ALLOWS one to define up to four words for function keys F1, F3, F5 and two words for function key F7. The four words are accessed with the use of the function key on its own, the function key and the shift key, the function key and the Commodore key and the function key and the Ctrl key. Each defined word can be up to nine characters in length and can include the abbreviated keywords like GΓ for Goto.

No spaces can be included in the words unless the code is altered. This is because the machine code picks up a space as the end of a word. Function key F7 and the Commodore key have been programmed to alter the border colour. Function key F7 and the Ctrl key have been programmed to alter the screen colours. The code is divided into six parts:

Part 1 displays the title and the start address of the code.

KEY DEFINE BY M. TINGLE SYS256*156 STARTS

The start location for the code is 39936 to 39999.

Part 2 sets the interrupt pointer to location 40013 which is the start of the main program.

Part 3 detects which key has been pressed and then jumps to the next routine.

Part 4 is the print word routine. The start location for the code is 40151 to 40167.

Part 5 is a delay routine that stops more than one word being printed on the screen. At the end of this routine is the jump for the exit from interrupt.

Part 6 changes the screen and border colour. At the end of changing colour it jumps to the delay routine to avoid too rapid a change of colour.

The ASC codes of the words are stored from location 40500 to 40640.

Two lines of the code will need to be altered to include spaces.

410 DATA E8,C8,C9, + + ,D0,F4,88,84,C6:REM
1170 POKE M, × × :REM

As the machine code picks up a specific character at the end of a word, a character not normally used would be the best substitute e.g. π. The ASC code for π is 255 and the hex value for 255 is FF. Then + + will be replaced by FF and × × will be replaced by 255.

If a carriage return is required at the end of a word the symbol ← is used. Although there is a check carried out on the data ensure that a copy is taken before running the program.

Logger

Steven Atkins,
Appleton,
Cheshire.

ATOM

IN THIS GAME for the Atom you drive a motorboat up a log-filled river. Controls are: left — Z and right — /.

Lines 30-160 assemble the code to scroll the screen downwards. Lines 170-250 assemble the code to draw banks, click the loudspeaker and scan the keyboard. Lines 270-280 clear the screen, draw banks and set up position of boat, A, number of logs, B, and distance travelled, D.

Lines 290-300 Link to the code (lines 30-250) and move the boat. Line 320 draws the boat and logs. Line 330 increments distance and every 100 distance increases the number of logs. Line 340 checks for the boat crashing. Lines 350-370 print distance and explode the boat. Line 380 asks for another game.

```
10DIMLL4;P.$21;F.
  A=0TO1;P=#2800
20[
30:LL0 LDX@#FF
40JSR#FE66
50:LL1 LDA#7FE0,X
60STA#8000,X
70LDA#80E0,X
80STA#8100,X
90DEX
100CPX@#FF
110BNELL1
120LDX@32
130LDA@32
140:LL3 STA#7FFF,X
150DEX
160BNELL3
170LDA@#FF
180STA#8000
190STA#801F
200LDA#B002
210EOR@4
220STA#B002
230:LL4 JSR#FE71
240STY#80
250RTS
260];N.;P.$6
270DO;P.$12;F.A=0TO#1E0 S.32;A?#8000=#FF;A?#801F=#FF;N.
280A=#81F0;B=1;D=0
290DO;LINKLL0;IF?#80=#3A;A=A-1
300IF?#80=#1F;A=A+1
310C=?A
320?A=1;IFA.R.%5<B;!(#8001+(A.R.%27))=-1
330D=D+1;IFD%100=0;B=B+1;?#8000=#7F;?#801F=#7F
340U.C<>32
350@=0;P."        YOU TRAVELLED:"D''';F.B=0TO200
360?A=R.;?#B002=?#B002:4;N.
370?A=#AB;F.A=0TO150;WAIT;N.
380P."AGAIN?";DO;LINKLL4;U.?#80<>#FF;U.?#80<>#39;E.
```

```
10 REM COMMODORE 64 FUNCTION KEYS BY
   MARK TINGLE, HARLOW, ESSEX.**********
100 DATA A0,00,B9,15,9C,99,50,04,A9,01
110 DATA 99,50,D8,C8,C0,28,D0,F0,4C,40
120 DATA 9C,0B,05,19,20,04,05,06,09,0E
130 DATA 05,20,02,19,20,0D,2E,14,09,0E
140 DATA 07,0C,05,20,13,19,13,32,35,36
150 DATA 2A,31,35,36,20,13,14,01,12,14
160 DATA 13,00,00,00 REM ** END OF NAME
   AND START ADDRESS DISPLAY ***********
170 REM START OF POINTER FOR INTERRUPT
180 DATA 78,A9,4D,8D,14,03,A9
190 DATA 9C,8D,15,03,58,60: REM END OF
   INTERRUPT POINTER
200 REM START OF DETECT WHICH FUNCTION
   KEY HAS BEEN PRESSED
210 DATA A5,C5,C9,04,D0,20,A2,00
220 DATA AD,8D,02,C9,01,D0,05,A2
230 DATA 0A,4C,D7,9C,C9,02,D0,05
240 DATA A2,14,4C,D7,9C,C9,04,D0
250 DATA 69,A2,1E,4C,D7,9C,A5,C5
260 DATA C9,05,D0,20,A2,28,AD,8D
270 DATA 02,C9,01,D0,05,A2,32,4C
280 DATA D7,9C,C9,02,D0,05,A2,3C
290 DATA 4C,D7,9C,C9,04,D0,43,A2
300 DATA 46,4C,D7,9C,A5,C5,C9,06
310 DATA D0,20,A2,50,AD,8D,02,C9
320 DATA 01,D0,05,A2,5A,4C,D7,9C
330 DATA C9,02,D0,05,A2,64,4C,D7
340 DATA 9C,C9,04,D0,1D,A2,6E,4C
350 DATA D7,9C,A5,C5,C9,03,D0,31
360 DATA A2,78,AD,8D,02,C9,00,F0
370 DATA 09,AD,8D,02,C9,01,D0,24
380 DATA A2,82: REM END OF KEY DETECTION
   ROUTINE ******************************
390 REM START OF PRINT WORD ROUTINE ***
400 DATA A0,00,BD,34,9E,99,77,02
410 DATA E8,C8,C9,20,D0,F4,88,84,C6:REM
   END OF PRINT ROUTINE ****************
420 REM START OF DELAY ROUTINE AND EXIT
   FROM INTERRUPT **********************
430 DATA A2,00,A0,00,C8,C0,FA,D0
440 DATA FB,E8,E0,FA,D0,F4,4C,31,EA:REM
   END OF DELAY ROUTINE ****************
450 REM START OF CHANGE SCREEN & BORDER
   COLOUR ROUTINE **********************
460 DATA C9,02,D0,06,AE,20,D0,4C
470 DATA 1A,9D,C9,04,D0,EF,AE,21
480 DATA D0,E8,E0,10,90,06,8E,21
490 DATA D0,4C,E8,9C,A2,00,4C,0F
```

(continued on page 225)

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For advertisement appearing on page number 28

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(continued from page 223)

```
500 DATA 9D,E8,E0,10,90,06,8E,20
510 DATA D0,4C,E8,9C,A2,00,4C,1F,3D
520 DATA * REM END OF DATA ************
530 POKE56,156 POKE52,156 REM   PROTECT
    CODE ************************************
999 L=39936 N=0 TT=0
1000 READ A$
1010 C=LEN(A$)
1020 IFA$="*"THEN1100
1030 A=ASC(A$)-48
1040 B=ASC(RIGHT$(A$,1))-48
1050 N=B+7*(B>9)-(C=2)*(16*(A+7*(A>9)))
1060 IFN<0ORN>255THEN1090
1070 POKEL,N  TT=TT+N
1080 L=L+1 GOTO1000
1090 PRINT"BYTE"L"=("A$")??" REM INVALID
     DATA ************************************
1100 IF TT<>32813 THEN PRINT"CODE ERROR
     RUN ABORTED." END REM CHECK ON DATA
1105 M=40500    REM START LOCATION FOR
     SPECIFIED WORDS *********************
1110 FOR T=1TO14
1120 N=M READ A$ FORA=1TOLEN(A$)
1130 B=ASC(MID$(A$,A,1))
1135 IF B=95 THEN B=13  REM CHECKS FOR A
     ←' SYMBOL TO DENOTE RETURN ********
1140 POKEM,B
1150 M=M+1
1160 NEXTA
1170 POKEM,32 REM THIS POKES THE CODE
     FOR A SPACE AND IS USED BY THE CODE
1175 REM TO DETECT THE END OF A WORD **
1180 M=N+10
1190 NEXT T
1200 DATA"POKE,","PEEK(","READ","RETURN"
1210 DATA"SAVE","LOAD","RUN←","DATA "
1220 DATA"GOTO","GOSUB","NEXT","PRINT"
1230 DATA"LIST←","FOR"
1300 PRINT"CLR"  SYS39936 CLR  NEW
```

Secret file

M Shackleton,
Cottingham,
Humberside.

ORIC

ON MOST COMPUTERS when you type CLoad or its equivalent the computer will load the first program it comes across on tape and display the file name. However, on the Oric the file name is not displayed. This can be very annoying if you forget a file and as, apparently, there is no way to find out. This program, which occupies well under 1K and can be Newed after running, provides a way of displaying the name of a file. Type in the Basic program, run and New then type:

CALL # 400

From now on any program loaded with CLoad will have its name displayed at the top of the screen in the reserved line after loading.

```
10 P=#400
20 READ A$:IF A$="END" THEN END
30 C=VAL("#"+A$):POKE P,C
40 P=P+1:GOTO20
50 DATA 78,A2,0D,8E,29,02,A2,04,
8E,2A,02,58,60,48,8A,48,98,48
,A2,80
60 DATA 86,00,A2,BB,86,01,A2,48,
86,02,A2,00,86,03,A0,0F,B1,02
,91,00
70 DATA 88,D0,F9,68,~8,68,AA,68,
4C,03,EC,"END"
```

Earhole

Trevor Cook,
Goole,
North Humberside.

SPECTRUM

AS SPECTRUM OWNERS will be aware from their manuals, the ear socket of the computer is read via bit 6 of I/O port 254 decimal. The program contains a short machine-code routine which returns in the BC register pair, a value which is proportional to the frequency of any tone which may be present at the ear socket. The routine is designed so that if no tone is present, a value of zero will be returned. I have located the routine at 32600 dec i.e., the start of the user-definable graphics area on the 16K Spectrum. Owners of 48K machines will need to modify this accordingly by modifying line 400.

Now that we have the means to obtain a tone value, what can we do with it? There are many possibilities but, to explore just one, the program Soundscan allows us to graphically represent tones applied to the ear socket, and although written in Basic it is still fast enough to be acceptable.

Type in and save the program with:

SAVE "SOUNDSCAN" LINE 100

On running, three modes of display will be available. These follow the form of normal graph, histogram-type graph, and a point-plot display. Options exist within the program to freeze and restart the display, and to change display mode.

Lines 250-275 contain the main routine, with the Let = USR Tone in line 255 collecting the tone value from the machine-code routine. Lines 400-410 Poke the machine code into memory. Users of 48K machines should change line 405 to Let Tone = USR "a" if they wish to assign the machine code to the UDG area of memory. This has the advantage that a change of RAMtop is not necessary.

Ideally, a cassette recorder with some form of monitoring facility should be used as it enables the user to listen to the cassette output and observe the display simultaneously, which reinforces the effects of the program. The display is particularly impressive if used in Mode 1, i.e., normal graph mode using a music cassette containing a prominent female vocalist as the sound source.

```
100 REM SOUNDSCANNER
101 REM      T.COOK 1983
102 DEF FN A(L)=1+INT (.5+L/30)
103 GO SUB 405
105 GO TO 200
110 DRAW INK FN A(L);X-N,-L+Y: LET X=N: LET Y=L:: RET
URN
120 DRAW INK FN A(L);0,-L: RETURN
200 PAPER 0: INK 7: BRIGHT 1: CLS
210 PRINT AT 1,9; INVERSE 1;"SOUND SCANNER"
215 PRINT AT 3,1;"This program gives a graphical  rep
resentation of audio signals applied to the Spectrum's
 'EAR' socket."
220 PRINT AT 8,1;" Insert a cassette (e.g music-  cas
sette),start tape and select  one of the following opt
ions:"
225 PRINT AT 13,8;"1) NORMAL GRAPH";AT 15,8;"2) BLOCK
GRAPH";AT 17,8;"3) DOT GRAPH"
230 INPUT INVERSE 1;"ENTER OPTION (1-3) ";Q: IF Q<1 O
R Q>3 THEN GO TO 230
250 CLS : PRINT AT 0,7; INVERSE 1;"'SPACE' TO FREEZE"
: LET I$="": LET X=0: LET Y=0
255 FOR N=0 TO 255 STEP 4: LET L=USR TONE: PLOT N,L
260 IF Q<3 THEN GO SUB 100+(Q*10)
265 LET I$=INKEY$: IF I$=" " THEN GO TO 300
270 NEXT N
275 GO TO 250
300 PRINT AT 0,5; INVERSE 1;"M=MENU  R=RESTART  E=END
": PAUSE 0
305 LET I$=INKEY$: IF I$="M" THEN RUN
310 IF I$="R" THEN GO TO 270
315 IF I$="E" THEN STOP
320 GO TO 300
400 DATA 1,0,255,17,0,0,219,254,203,119,32,1,19,16,24
7,66,75,201
405 LET TONE=32600
410 FOR N=TONE TO TONE+17: READ D: POKE N,D: NEXT N:
RETURN
```

Acetrace

Alan Wagstaff,
Richmond,
North Yorkshire.



HERE ARE TWO assembly-language programs for the BBC Micro. They can come in very handy when faced with bugs in long Basic programs.

The Trace facility on the BBC Micro is useful but there are occasions when one is left gazing at a screenful of line numbers, obscuring the program display and leaving one feeling a trifle non plussed.

Acetrace displays the Basic line number which is about to be executed in the top left hand corner of the screen. There is then a pause for about 2.5 seconds, which can be cut short by pressing a key, then the line is

(continued on next page)

(continued from previous page)

executed.

The assembly-language program produces machine code starting at address D01 hex. It also sets up function key 9 to enable Oswrch to be vectored to the machine code and also switch on the Trace facility.

To use Acetrace, enter and run the listing. Then enter New and load in the Basic program to be debugged. Press function key 9 then run the Basic program. When you have seen enough, press Break followed by Old. This restores the normal Oswrch vector. Acetrace is still available by pressing function key 9 provided this has not been altered.

Dynvars produces a machine-code routine starting at D01 hex. This code, when called, prints the names of all dynamic variables used by a Basic program.

To use it, enter the listing and run it. Then enter and run the Basic program. Entering

CALL &D01

will list the Basic programs variables.

```
30REM ACETRACE
40REM A.WAGSTAFF
1983
50oswrch=&E0A4
60osbyte=&FFF4
70FOR F%=0 TO 1
80P%=&D01
90[OPT F%*2
100STA M
110CMP #91
120BNE space
130LDA #1
140STA M+1
150LDA #134
160JSR osbyte
170STX M+3
180STY M+4
190LDA #117
200JSR osbyte
210TXA
220AND #32
230BEQ tab
240LDA #1
250STA M+2
260LDA #4
270JSR oswrch
280.tab
290LDA #31
300JSR oswrch
310LDA #0
320JSR oswrch
330JSR oswrch
340BEQ arec
350.space
360CMP #32
370BNE arec
380LDA M+1
390BEQ arec
400LDA #0
410STA M+1
420LDA #129
430LDX #255
440LDY #0
450JSR osbyte
460LDA #31
470JSR oswrch
480LDA M+3
490JSR oswrch
500LDA M+4
510JSR oswrch
520LDA M+2
530BEQ zera
540LDA #5
550JSR oswrch
560LDA #0
570STA M+2
580.zera
590LDA #0
600BEQ fini
610.arec
620LDA M
630.fini
640JMP oswrch
650]
660M=P%
670NEXT
680*KEY9?&20E=1:?&
20F=&D|MTRACE ON|M
```

Dragon Artist.

```
1 PCLEAR4
10 L=1:B=0:PM=4:SC=1:FC=1
20 D=1
30 REM *** DRAW AT SMALL ***
40 PMODE PM,1:SCREEN1,SC
50 PX=JOYSTK(0)*4
60 PY=JOYSTK(1)*3
70 Q$=INKEY$
80 IF Q$="C" THEN PCLS(CC)
90 IF Q$="." THENR=SQR((CX-PX)^2+(CY-PY)^2)
100 PSET(PX,PY,CC)
110 PRESET(PX,PY)
120 IF Q$="L"THEN L=1:B=0
130 IF Q$="O"THEN 330
140 IF Q$="B"THEN L=0:B=1
150 IF Q$="S"THEN SC=ABS(SC-1)
160 IF Q$="D"THEN D=1
170 IF Q$="U"THEN D=0
180 IF Q$="."THEN CIRCLE(CX,CY),R,CC
190 IF Q$="1"THEN PM=1
200 IF Q$="2"THEN PM=2
210 IF Q$="3"THEN PM=3
220 IF Q$="4"THEN PM=4
230 IF Q$="0" THEN CX=PX:CY=PY
240 IF Q$="P"THEN PAINT(PX,PY+1),CC,CC
250 PE=PEEK(65280)
260 IF PE=126 OR PE=254 THEN CC=CC+1
270 IF CC>8 THEN CC=0
280 DRAW"C"+STR$(CC)
290 IF L=1AND D=1 THEN LINE-(PX,PY),PSET
300 IF L=1 AND D=0 THEN LINE(CX,CY)-(PX,PY),PSET
310 IF B=1 THEN LINE(CX,CY)-(PX,PY),PSET,BF
315 AUDIOOFF
320 GOTO40
330 CLS
340 PRINT"SAVE OR LOAD (S/L)"
350 E$=INKEY$:IF E$=""THEN 350
360 INPUT"NAME OF FILE";NM$
370 IF E$<>"S"AND E$<>"L"THEN 40
380 ST=1536
390 IF PM=1 OR 2 THEN EN=4607
400 IF PM=3 OR 4 THEN EN=7679
410 CLS
420 PRINT@202,"READY RECORDER"
430 MOTORON
435 IF E$="L" THEN 500
440 X$=INKEY$
460 IF E$="S" THEN PRINT@234,"SAVING ";NM$
465 IF X$=""THEN 440
466 AUDIOON
470 PMODE PM,1:SCREEN SC
490 CSAVEMNM$,ST,EN,EN-ST
494 GOTO40
500 IF E$="L"THENPRINT@234,"LOADING ";NM$
505 A$=INKEY$:IF A$=""THEN 505
510 PMODE PM,1:SCREEN1,SC
520 IF E$="L"THEN PCLS
521 AUDIOON
530 CLOADMNM$
540 AUDIOOFF
600 GOTO40
```

Artist

R Billingham,
Upper Bangor,
Gwynedd.

DRAGON

THIS IS A COMPLICATED Artist program allowing use of all the Dragon's graphics modes and all colours the pictures can be Saved or Loaded from tape under program control. The joystick moves the flashing point cursor around the screen.

Control keys.

C	Clears screen to present colour.
S	Changes hi-res screen — 0 or 1.
1.2.3.4.	Chooses resolution — mode.
0	Sets a fixed reference point.
L	Draws line between the last cursor position and the present one.
O	Draws cursors with L.
U	Is the opposite of O and as Undraw which joins all cursor points with the fixed point from O.
B	Box — alternative to line L draws boxes to last point etc.
.	Draws circle centre 0 and radius to present point in present colour.
Fire button	Changes colour (0-8).
P	Part area in colour up to border of present colour.
O	Output/input screens to tap.

Auto line number

D North,
Ripley,
Derby.

SPECTRUM

THESE PROGRAMS produce automatic line numbering for either the 48K or 16K Spectrum. The machine-code program is stored above RAMtop and is called automatically by diverting the interrupt which occurs every 20ms.

The following system variables are used in the program:

ECHO E, LAST K, FLAGS, E PPC and KSTATE

A checksum is used in each program to warn if there is an error in the Data lines. If the error-in-data message appears when the program is run then carefully check through these lines correcting any errors, and run the program again, until the instructions appear.

To turn the program on:

RANDOMISE USR 65121

or 32340 for 16K machines. Pressing Enter again should produce 0010 for the first line number. If at any stage you wish to alter the next line number then delete the number printed and type in the next number required after which automatic numbering will continue from this line. The step between line numbers can be altered by Poking the required value into 65192 — 32411 for 16K.

If the Enter key is held down the routine will rapidly run through the line numbers. This can be used if you want to delete part of a program, by entering the first line number to be deleted and simply holding Enter down until the last number to be deleted is reached.

If the line number exceeds 9999 a colon — : — will be printed in the first digit position to warn that the line cannot be entered.

To turn the routine off delete the last

(continued on page 231)



Auto line 16K.

```
1010 CLEAR 32329: PRINT
     "STAND BY"
1020 LET C=0: RESTORE 1060: FOR
N=32330 TO 32486: READ A: POKE N
,A: LET C=C+A: NEXT N: IF C<>178
48 THEN PRINT FLASH 1;"ERROR IN
DATA": STOP
1030 PRINT AT 0,0;"  **AUTO LINE
NUMBER ROUTINE**";"   POKE 32411
 WITH STEP REQUIRED"
1040 PRINT : PRINT "RANDOMIZE US
R 32340 TO TURN ON"
1050 PRINT : PRINT "RANDOMIZE US
R 32330 TO TURN OFF"
1060 DATA 62,62,237,71,237,86,20
1,0,0,0,62,40,237,71,237,94,201
1070 DATA 0,255,243,245,229,213,
197,58,91,126,254,0,32,39,58,130
,92,254,32,32,113,58,131,92,254,
23,32,106,33,8,92,126,254,13,40,
58,33,4,92,126,254,13,40,4,254,2
35,32,36,62,4
1080 DATA 50,91,126,58,91,126,61
,50,91,126,42,73,92,17,10,0,25
1090 DATA 1,24,252,205,196,126,2
54,3,40,57,1,156,255,205,196,126
,254,2,40,47,1,246,255,205,196,1
26,254,1,40,37,1,255,255,205,196
,126,24,29
1100 DATA 175,9,60,56,252,237,66
,61,198,48,229,33,8,92,119,58,59
,92,203,239,33,59,92,119,225,53,
61,126,201,193,209,225,241,251,2
01
```

Auto line 48K.

```
1010 CLEAR 65110: PRINT
     "STAND BY"
1020 LET C=0: RESTORE 1060: FOR
N=65111 TO 65267: READ A: POKE N
,A: LET C=C+A: NEXT N: IF C<>190
86 THEN PRINT FLASH 1;"ERROR IN
DATA": STOP
1030 PRINT AT 0,0;"  **AUTO LINE
NUMBER ROUTINE**";"   POKE 65192
 WITH STEP REQUIRED"
1040 PRINT : PRINT "RANDOMIZE US
R 65121 TO TURN ON"
1050 PRINT : PRINT "RANDOMIZE US
R 65111 TO TURN OFF"
1060 DATA 62,62,237,71,237,86,20
1,0,0,0,62,9,237,71,237,94,201
1070 DATA 0,255,243,245,229,213,
197,58,104,254,254,0,32,39,58,13
0,92,254,32,32,113,58,131,92,254
,23,32,106,33,8,92,126,254,13,40
,58,33,4,92,126,254,13,40,4,254,
255,32,36,62,4
1080 DATA 50,104,254,58,104,254,
61,50,104,254,42,73,92,17,10,0,2
5
1090 DATA 1,24,252,205,209,254,2
54,3,40,57,1,156,255,205,209,254
,254,2,40,47,1,246,255,205,209,2
54,254,1,40,37,1,255,255,205,209
,254,24,29
1100 DATA 175,9,60,56,252,237,66
,61,198,48,229,33,8,92,119,58,59
,92,203,239,33,59,92,119,225,53,
104,254,201,193,209,225,241,251,
201
```

Add the professional touch to your ZX81 starter pack

A GREAT IDEA FOR CHRISTMAS

£34.95 incl VAT

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The Memotech plug-in Keyboard plus buffer pack takes the effort out of data entry for ZX81 users. The Keyboard has a light professional touch and is housed in an elegant aluminium case. The simple plug-in system means that you are not obliged to open up your ZX81, use a soldering iron or invalidate your ZX81 warranty.

Keyboard Buffer Pak
The Buffer Pak performs a "housekeeping" function for the Keyboard, interfacing directly with the port of your ZX81.

The complete range

RS232 Interface
The RS232 is an all-purpose interface which allows the ZX81 not only to output to suitable serial printers, but can link up with numerous types of peripheral or even other processors. The Interface has two main modes of operation: BASIC mode allows you to use the range of functions supplied in the RS232 EPROM within an ordinary BASIC program, and TERMINAL mode allows you to use your ZX81 as a terminal to another processor. The EPROM functions offered permit the user to send, receive and convert bytes between ZX81 code and ASCII, as well as check the status of numerous control flags. Received or transmitted data can appear simultaneously on the screen, and received data may be printed simultaneously.
£39.95 inc. V.A.T.

Memopak Centronics I/F
The BASIC commands LPRINT, LLIST and COPY are used to print on any CENTRONICS type printer. All ASCII characters are generated and translation takes place automatically within the pack. Reverse capitals give lower case. Additional facilities allow high resolution printing.
£24.95 inc. V.A.T.

Memopak HRG
This pack breaks down the constraints imposed by operating at the ZX81 character level and allows high definition displays to be generated. All 248 × 192 individual pixels can be controlled using simple commands, and the built in software enables the user to work interactively at the dot, line, character, block and page levels.
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Memocalc
The screen display behaves as a 'window' on a large sheet of paper on which a table of numbers is laid out. The maximum size of the table is determined by the memory capacity, and with a Memopak 64K a table of up to 7000 numbers with up to 250 rows or 99 columns can be specified.
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Text is first arranged in 32 character lines for the screen with comprehensive editing facilities. On output the user simply chooses the line length required for printing and the system does the rest. Used with the Memopak Centronics Interface, the Word Processor makes available printout with 80 character lines, upper and lower case and single and double size characters.
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For those just setting out on the road to real computing, these packs transform the ZX81 from a toy to a powerful computer. Data storage, extended programming and complex displays all become feasible. Further details available on request.
16K Memopak £24.95
32K Memopak £34.95
64K Memopak £49.95
Prices inclusive of V.A.T.
Memopaks are available at main branches of W.H. Smith and John Menzies.

Z80 Assembler
The Assembler allows you first to code and edit a source program in the Z80 language, and then assemble it into machine code. You can now write flexible and economic programs. The Editor mode allows you to code directly in the right format, manipulate individual lines and control the exact placing of source and machine code. Routines may be merged or listed (even to a commercial printer using our Centronics Interface). The assembler mode handles all standard Z80 mnemonics, numbers in hex or decimal, comments and user-selected labels.
£29.90 inc. V.A.T.

All prices are inclusive of V.A.T., postage and packing.

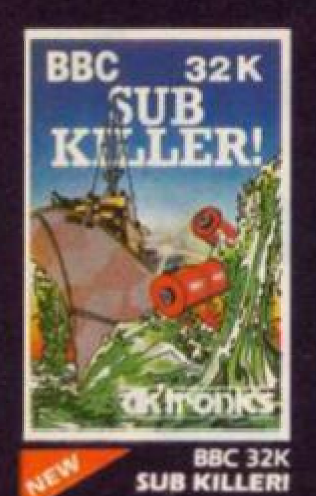
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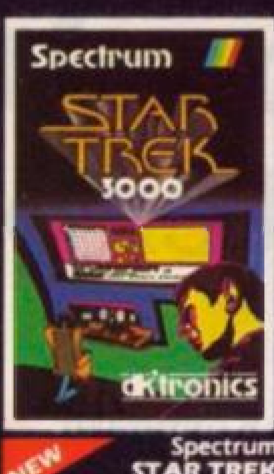


MEMOTECH

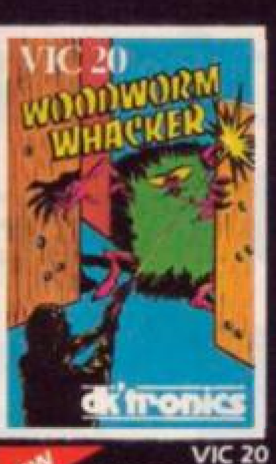
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Telephone Witney 2977



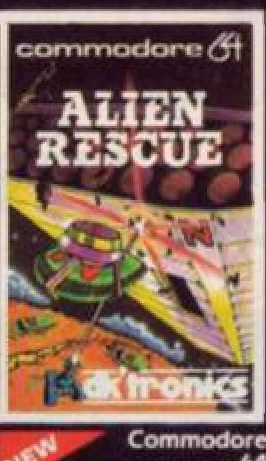
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NEW Spectrum STAR TREK 3000




NEW VIC 20 WOODWORM WHACKER

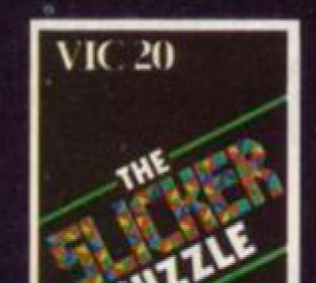


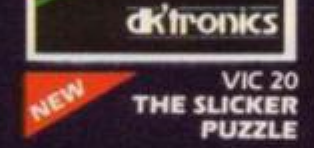


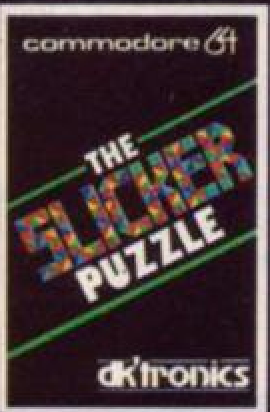
NEW Commodore 64 ALIEN RESCUE

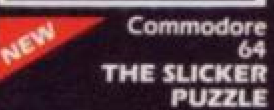


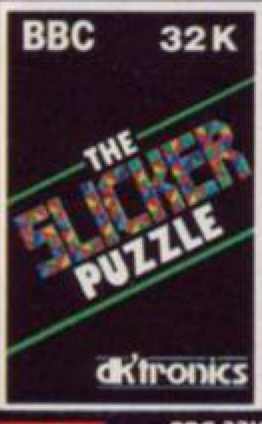
NEW BBC 32K SUPER FRUITS

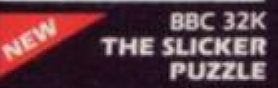


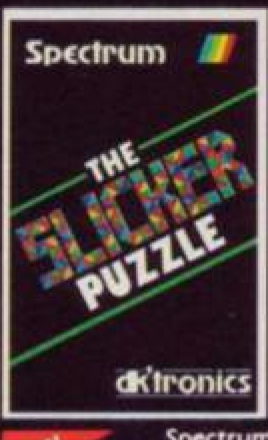

NEW VIC 20 THE SLICKER PUZZLE



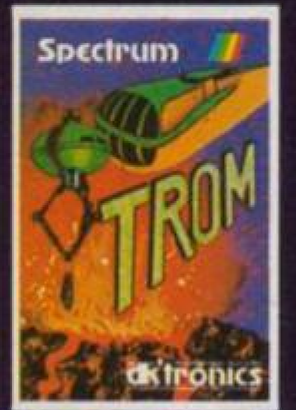

NEW Commodore 64 THE SLICKER PUZZLE




NEW BBC 32K THE SLICKER PUZZLE



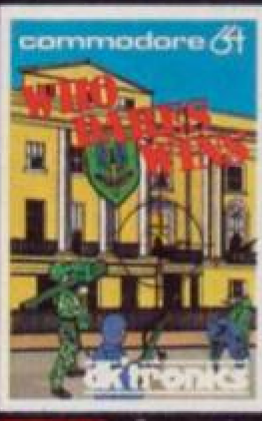

NEW Spectrum THE SLICKER PUZZLE



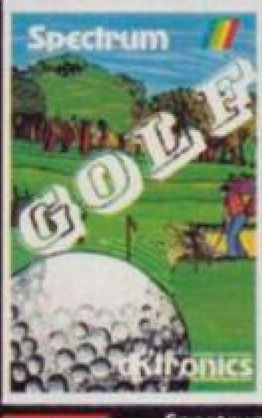

NEW Spectrum TROM



NEW Spectrum 2003 A SPACE ODDITY



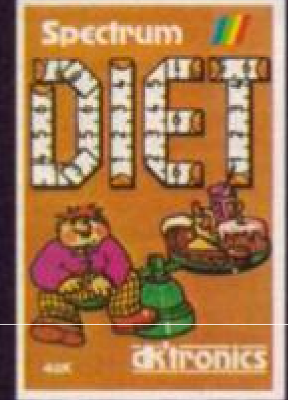
NEW Commodore 64 WHO DARES WINS



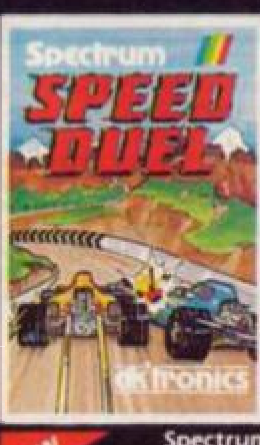
NEW Spectrum GOLF



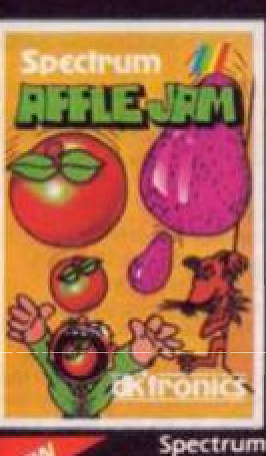
NEW Spectrum MUNCH MAN



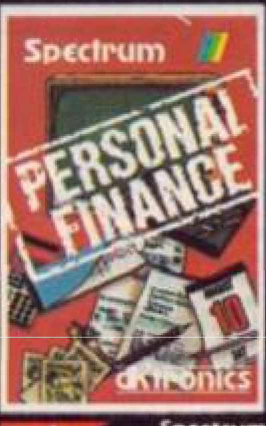
NEW Spectrum DIET



NEW Spectrum SPEED DUEL



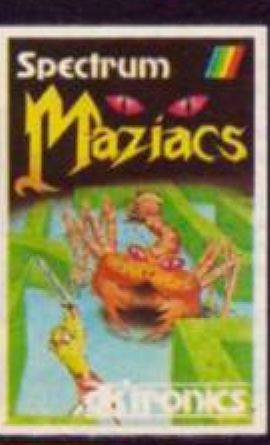
NEW Spectrum APPLE JAM



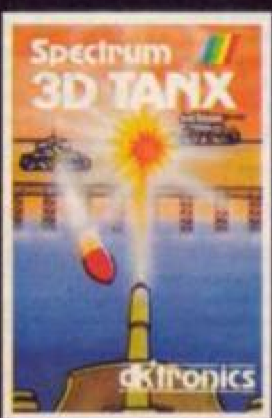
NEW Spectrum PERSONAL FINANCE



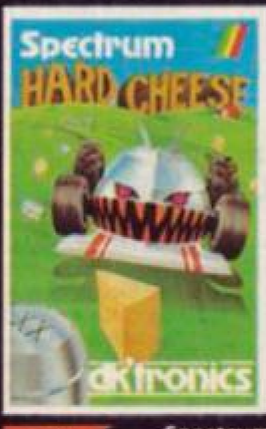
Spectrum SOUND FX



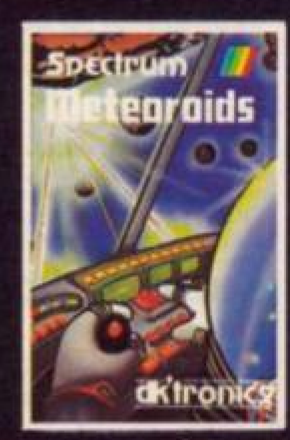
NEW Spectrum MAZIACS



Spectrum 3D TANX



NEW Spectrum HARD CHEESE



Spectrum METEOROIDS



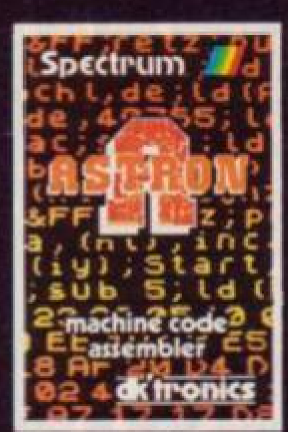
ZX81
3D GRAND PRIX



Spectrum
DISTRON



Spectrum
ZXED



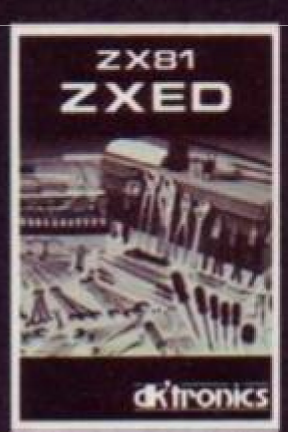
Spectrum
ASTRON



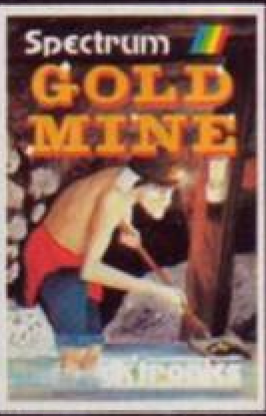
Spectrum
FRUIT MACHINE



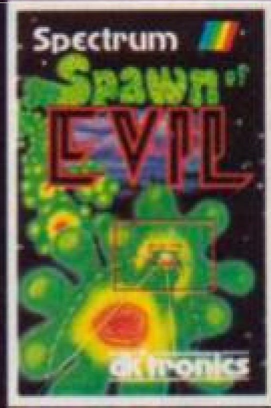
NEW
Commodore 64
MILLIE-BUG



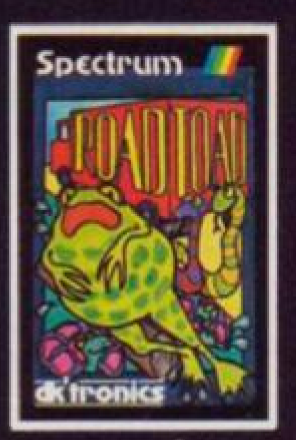
ZX81
ZXED



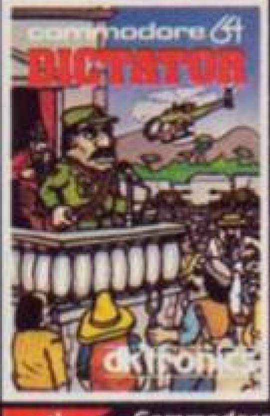
Spectrum
GOLD MINE



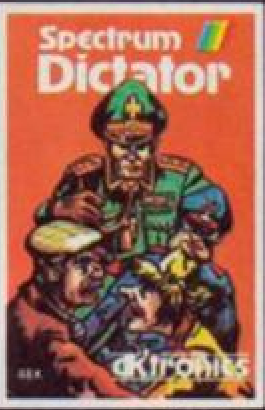
Spectrum
SPAWN OF EVIL



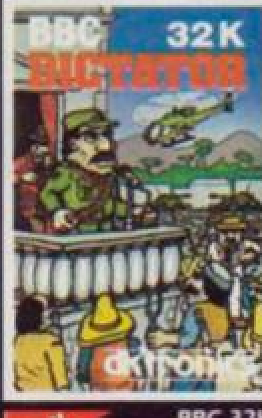
Spectrum
ROAD TOAD



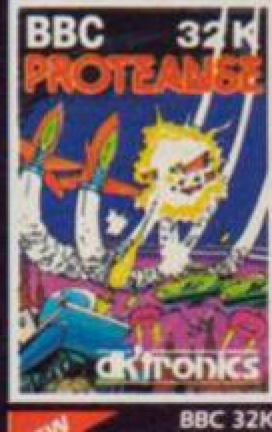
NEW
Commodore 64
DICTATOR



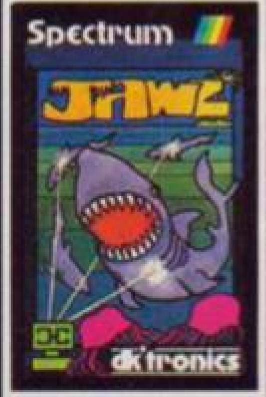
Spectrum
DICTATOR



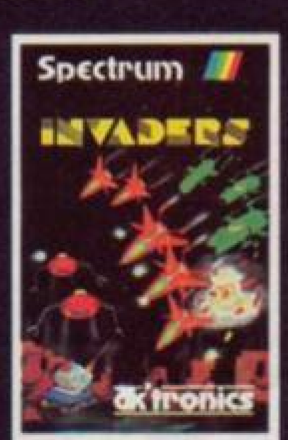
NEW
BBC 32K
DICTATOR



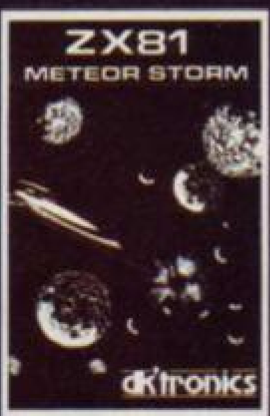
NEW
BBC 32K
PROTEANSE



Spectrum
JAWZ



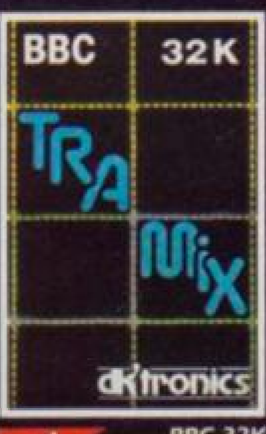
Spectrum
INVADERS



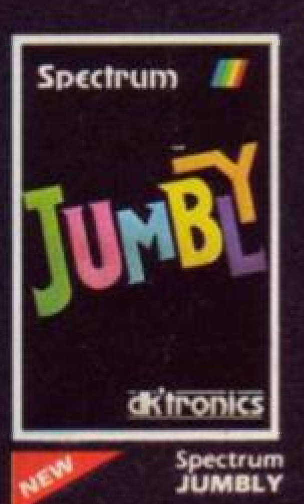
ZX81
METEOR STORM



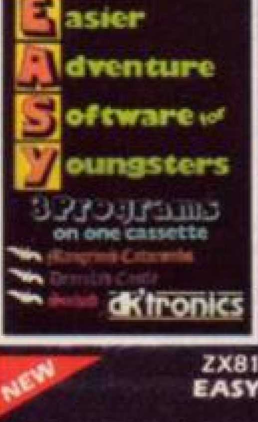
Spectrum
CENTI-BUG



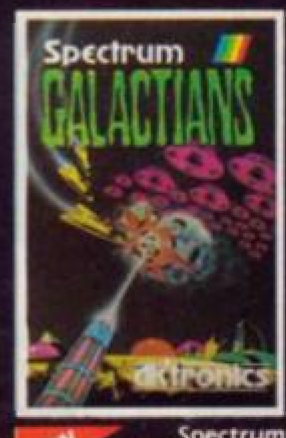
NEW
BBC 32K
TRAMIX



NEW
Spectrum
JUMBLY

NEW
ZX81
EASY





NEW
Spectrum
GALACTIANS



NEW
Spectrum
TRAMIX

See page 224 for further details and order form

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Choosing which game to buy from the mountain available is a difficult job, especially when everyone claims to produce the best on the market. But how can you tell the best from the rest?. To help you decide, read on. . . .



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HALLS OF THE THINGS

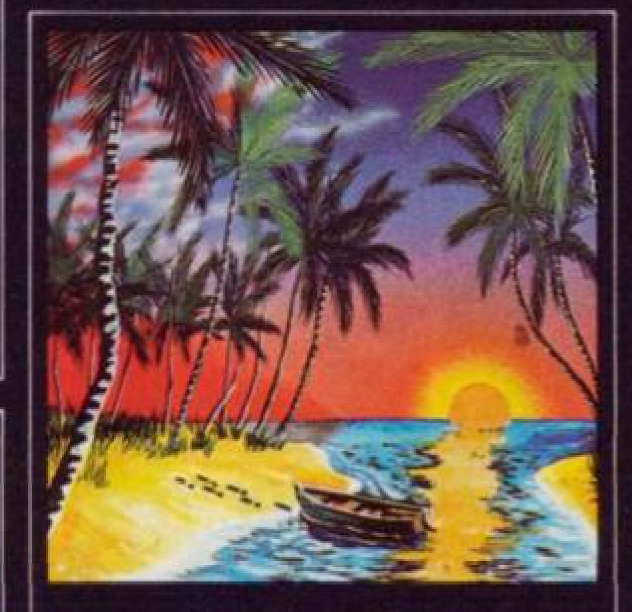
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Written by Simon Brattel and Neil Mottershead.



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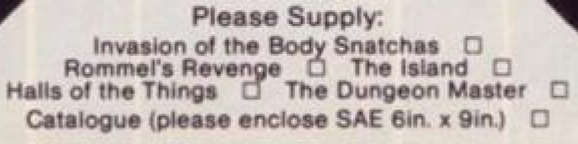
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(continued from page 226)

number printed and type

RANDOMISE USR 65111

or 32330 for 16K. This should always be done before using any other program which uses interrupts.

When the program has been successfully run it can be Saved by:

SAVE "AUTO LINE 48K" CODE 65111,157

or

SAVE "AUTO LINE 16K" CODE 32330,157

This can then be quickly loaded when required, but remember to set RAMtop first to protect the program. Alternatively, the program can be loaded from the Basic listing, and after turning on the routine the Basic lines can be quickly removed by the method described. Incidentally, it is possible to have program names longer than 10 characters by using keywords in the name. These are only available in the extended mode.

Stringdump

G Jones,
Wiltshire.

VIC-20

STRINGDUMP IS A non-relocatable machine-code routine which will print out all the string variables currently used by the Vic-20, except those stored in arrays. It is loaded by the Basic loader program into memory starting at decimal location 7424 — just below the screen memory — and is protected from the Basic program and its variables by lowering the top of memory pointer. After the machine code has been loaded, the Basic loader will New itself. The routine may then be called by SYS 7424 when needed.

Lines 10 to 50 set up a two-byte pointer to point to the end of program/start of variables by Poking 251, Peek (45) and Poking 252, Peek, (46) — in machine code. Lines 60 to 230 check for a string variable by searching through memory to find a valid sequence of characters corresponding to the name of a string and printing them, followed by "$=".

Control then passes to the routine Stringprint which calculates the start address of the string and prints it, the length of which is determined by the contents of the Y register. After the string is printed, a carriage return is printed to move down a line and then a check is made to ensure that the end of variables address has not been reached.

If it has, then the program is terminated in line 430 by jumping back to Basic. Otherwise, the whole process of searching for and printing a string is repeated. Also included in Stringdump is a means to Stop the program at will by pressing the stop-key. This is desirable when dumping a lot of strings since the string you wish to examine may scroll off the top of the screen unless the listing can be stopped.

```
2 POKE36879,8:PRINT"■"
3 PRINT"❐       STRINGDUMP":PRINT"          ━━━━━━━━━━":PRINT"■■■KLOADING M/C)"
5 POKE55,255:POKE56,28:POKE7423,0
10 DATA162,2,181,44,149,250,202,208,249,24,144,68
20 DATA32,95,29,32,106,29,160,6,201,91,176,244,201,41,144,240,133,253,32,106,29
160,5
30 DATA201,128,144,229,201,218,176,225,233,127,133,254
40 DATA165,253,32,122,242,165,254,32,122,242,169,36,32,122,242,169,61,32,122,24
2
50 DATA32,117,29,160,2,32,95,29,169,13,32,122
60 DATA242,165,252,197,48,144,6,165,251,197,47,144,176,76,103,228
70 DATA192,0,240,6,32,106,29,136,208,250,96
80 DATA162,0,161,251,230,251,208,2,230,252,96
90 DATA32,106,29,168,132,0,32,106,29,133,253,32,106,29,133,254,164,0,192,0,208,
1,96
100 DATA160,0,177,253,200,32,122,242,196,0,144,246,32,225,255,240,1,96,76,103,2
28,96
110 FORR=7424TO7585:READD:POKER,D:NEXT
115 PRINT"■■■■■■■■■■■■ ■HIT A KEY WHEN READY■"
117 GETA$:IFA$=""THEN117
120 PRINT"❐"SYS7424"TO USE.":NEW
```

Graffiti

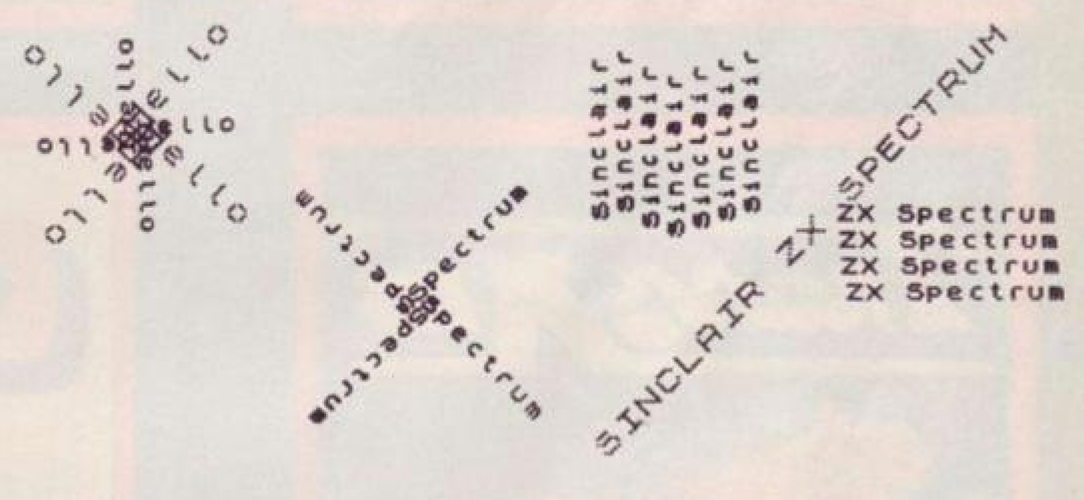
Ian Fildes,
Wheldrake,
York.

SPECTRUM

GRAFFITI IS A program for the 48K Spectrum which lets you write on the screen in any of eight directions.

The program works by printing your message at the bottom of the screen in the same colour as the paper so it cannot be seen. This part of the screen is now scanned by the point command and if this gives a positive result the computer jumps to a special plot routine depending on which way up you wish to write.

A problem arises when you wish to ask the user a question, you have to write to the screen and disrupt the display. So two short machine-code routines are used to move the screen around in memory.



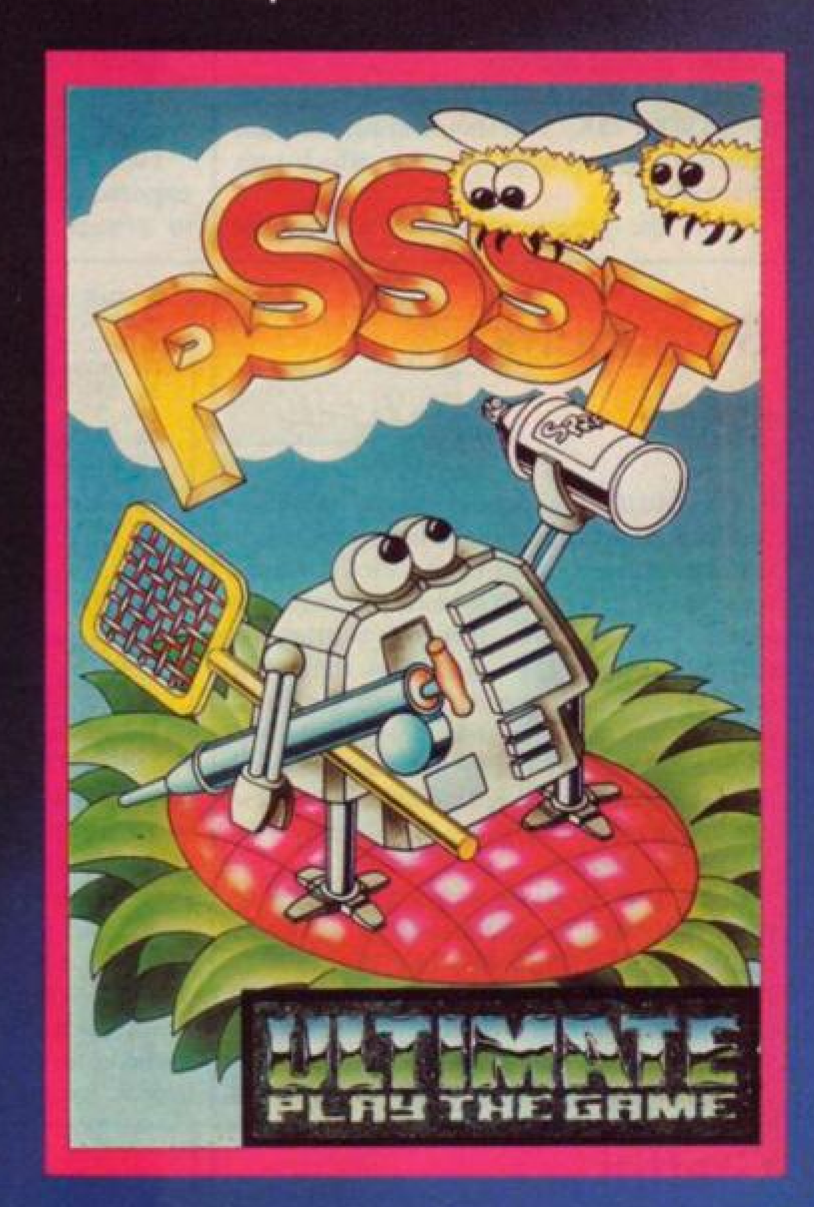


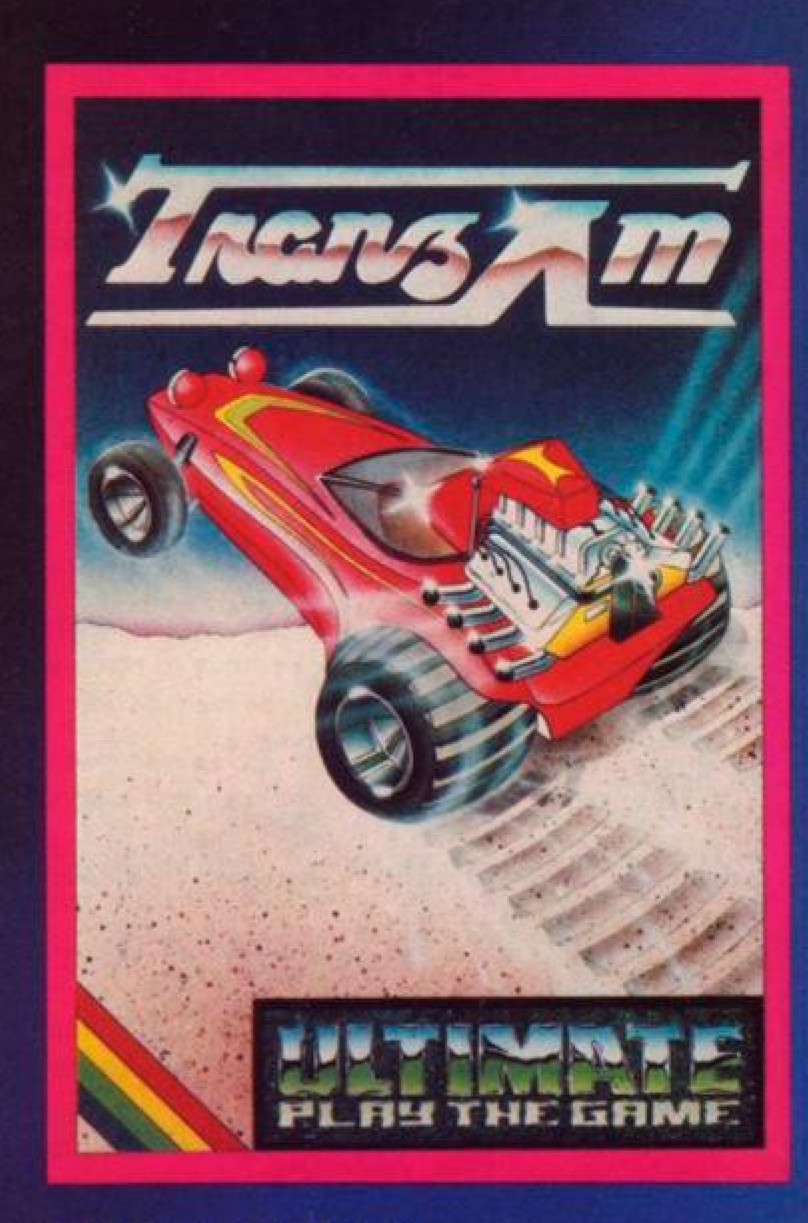
```
10        Video Graffiti
20
30 REM © Iain Fildes 1983
35
40 CLEAR 39999: FOR n=40000 TO
 40023: READ a: POKE n,a: NEXT n
45 DATA 33,0,64,17,80,195,1,19
2,26,237,176,201,33,80,195,17,0,
64,1,192,26,237,176,201
50 GO SUB 7000
60 GO SUB 8000
70
80 CLS : PRINT #0;"Menu=m"
85 LET a$=INKEY$: IF a$="m" OR
 a$="M" THEN GO SUB 9000
86 IF a$="" THEN GO TO 85
90 CLS : PRINT #0;"Which direc
tion do you wish to  write in ?(
1 TO 8)"
100 LET a$=INKEY$: IF a$>"8" OR
 a$<"1" THEN GO TO 100
115 LET a=VAL a$
120 INPUT "Message ";m$
125 IF LEN m$>20 THEN GO TO 120
130 INPUT "X start",x
140 INPUT "Y start",y
145 RANDOMIZE USR 40012
150 PRINT AT 21,0; INK c; PAPER
 c;m$
160 FOR n=0 TO LEN m$*8
170 FOR o=0 TO 7
180 IF POINT (n,o)=1 THEN GO SU
B 1000+10*a
190 NEXT o: NEXT n
200 RANDOMIZE USR 40000
210 GO TO 80
1000 REM plots
1010 PLOT o-x,n+y: RETURN
1020 PLOT n+x-o,n+y+o: RETURN
1030 PLOT n+x,o+y: RETURN
1040 PLOT n+x+o,o+y-n: RETURN
1050 PLOT o+x,n-y: RETURN
1060 PLOT n-x-o,n-y+o: RETURN
1070 PLOT n-x,o-y: RETURN
1080 PLOT n-x+o,o-y-n: RETURN
7000 PRINT "           Graffitti"
: PRINT AT 0,0; OVER 1;"
__________"
7010 PRINT ''''     This program
 lets you write on the screen in
 8 directions."
7020 PRINT "    The screen can b
e COPYed to the ZX-printer.""To
 save the screen being         de
stroyed by prompts and quest- io
ns from the computer,the      sc
reen is copied into ram and   br
ought back down after the     qu
estions have been asked."
7030 PRINT "     There are 8 dir
ections thatyou can write in and
 they go     from 1 to 8 clockwis
e."
7040 RETURN
8000 PRINT #0;"Paper Colour ?(0
TO 9)"
8010 LET a$=INKEY$
8020 IF a$>"9" OR a$<"0" THEN GO
 TO 8010
8030 PAPER VAL a$: CLS : FOR n=0
 TO 100: NEXT n: LET c=VAL a$: C
LS : RANDOMIZE USR 40000
8040 PRINT #0;"Ink Colour ?(0 TO
 9)"
8050 LET a$=INKEY$
8060 IF a$>"9" OR a$<"0" THEN GO
 TO 8050
8070 INK VAL a$: CLS : FOR n=0 T
O 100: NEXT n
8080 PRINT #0;"Border Colour ?(1
 TO 7)"
8090 LET a$=INKEY$
8100 IF a$>"7" OR a$<"0" THEN GO
 TO 8090
8110 BORDER VAL a$: FOR n=0 TO 1
00: NEXT n: RETURN
9000 CLS : PRINT "MENU"''''"1.Ch
ange colours.""2.Clear screen."
'"3.COPY to Printer.""4.SAVE sc
reen to tape.""5.None of these
and return."
9010 PRINT #0;"1,2,3 or 4"
9020 LET a$=INKEY$: IF a$>"5" OR
 a$<"1" THEN GO TO 9020
9030 IF a$="1" THEN FOR n=0 TO 1
00: NEXT n: GO SUB 8000
9040 IF a$="2" THEN CLS : RANDOM
IZE USR 40000
9050 IF a$="3" THEN RANDOMIZE US
R 40012: PRINT AT 21,0;"
                        ": COPY
9060 IF a$="5" THEN INPUT "file
name ?";a$: RANDOMIZE USR 40012:
 SAVE a$SCREEN$
9070 FOR n=0 TO 100: NEXT n: RET
URN
```

JET PAC–
16/48K ZX Spectrum or 8K Expanded VIC 20

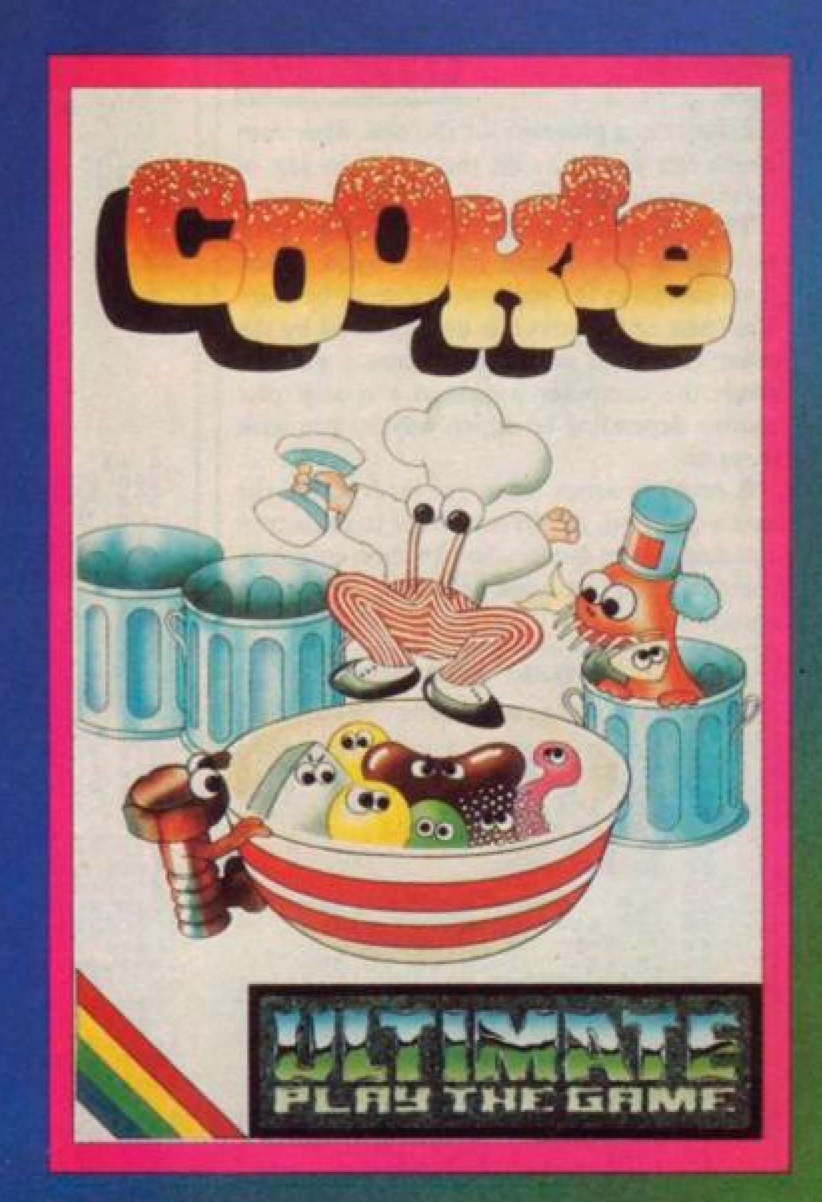


PSSST–
19/48K ZX Spectrum



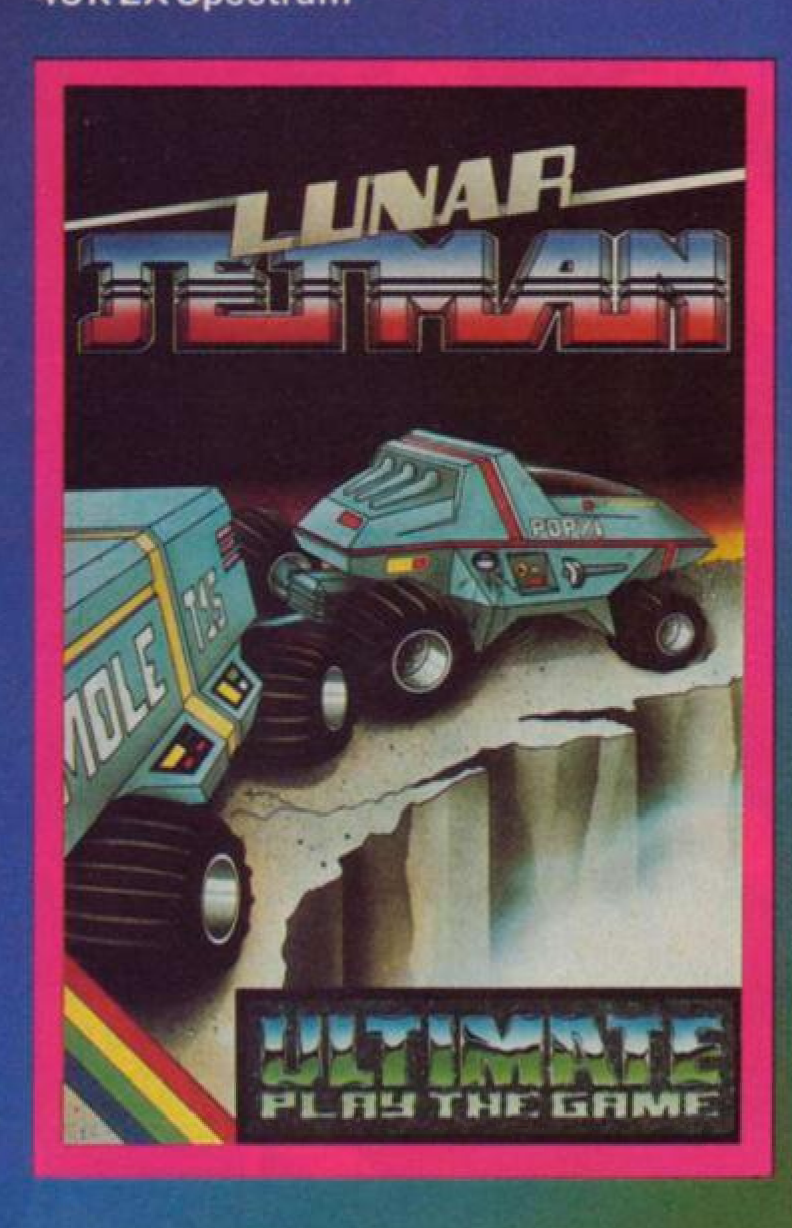



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16/48L ZX Spectrum



COOKIE–
16/48K ZX Spectrum

LUNAR JETMAN –
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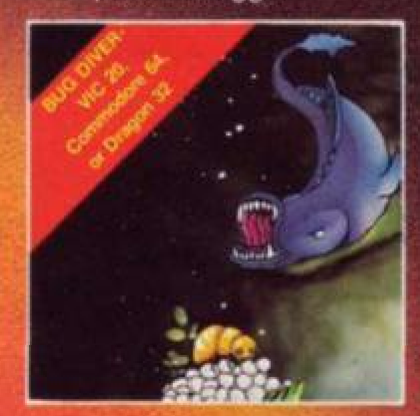


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COMPETITION CORNER

If you want to set a competition for Competition Corner, remember that the simplest solution should be calculable by a short program rather than by any other form of reckoning.



COMPETITION RESULTS

OCTOBER'S COMPETITION offered Atari's 600XL as prize. Contestants were asked to solve the crossword and finish the sentence, "I would excel with the new Atari because..."

Naturally there were dozens of "xlellents" and "atarifics" as in B. Jeeves' "the XLent XL makes it easy to XL" or S. Brewell's "it's atarific computer with an extra large future". These we thought were a little too obvious. Other entries smacked of the world of the advertising jingle. R. Buttery suggested, "it's the ideal suitor for student or tutor" while D. Gilbert wrote, "for computer needs ... Atari leads".

Many of the most entertaining entries were also the most irrelevant. C. Harris told us, "I am a binary based being from Betelgeuse". To which the reply might be: fascinating but how does Atari enter into it? Even more off-beam was M. Jasztal's "Mad frogs and Englishmen play well on the 800's son".

Some entries free-associated with abandon. The sequence of ideas seemed to be: XL600, rode the 600 ... Light Brigade! This produced J. Wilkinson's "the noble 600 leads the charge of the byte brigade".

On a slightly saner note R. Ford offered the crisp, "my ZX is OK but an XL would be KO"; S. Crump hoped he would have "wintry nights on an Atari — only the start of an I.C. safari"; and N. Milne pointed out that "with an Antic or two you miss the queue for the 6502".

Choosing from among so many entries would have proved tricky indeed. Fortunately, Atari itself saved us the trouble by exercising the right as prize-giver to pick the winner. We submitted a shortlist of some 20 entries. The company awarded the prize to Les Isbister, 1 Mulberry Close, Biggleswade, Bedfordshire, who said "its expandability takes the growing pains out of computing". Navy man R. Mills came a close second with "A tar I am, at sea I am, bored I am". There were only a few correct answers to October's Woodworm puzzle.

The first picked from the competition bag came from Andrew Scott, 55 Huntley Grove, Peterborough.

The maximum variety Willy the Woodworm can enjoy is 39. This total can be arrived at by following a number of different routes. The sequences 9,2,7,12,5,8,3 and 1,7,13,9,2,6,11,4 are two possibilities.

THE REVOLUTION IS HERE

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```
2 REM *         BOMBER          *
3 REM *   By RICHARD TAYLOR     *
4 REM * © CRL September '83     *
5 REM ***************************
6 REM
10 RANDOMIZE 1000
20 RANDOMIZE USR 61030
30 RANDOMIZE : BORDER 6
40 OVER 0: INVERSE 0: FLASH 0
50 BRIGHT 0: INK 0: PAPER 7
60 CLS
70 GO SUB 9000
80 GO SUB 8000
90 LET Hi=0: LET z=1: LET Score=0
100 CLS : PRINT "  HI:";Hi;TAB 20;"SCORE:";Score
110 PLOT 0,163: DRAW 255,0
120 LET a=4000: REM LIMIT a
130 LET a=6000: REM INTERACT a
140 GO SUB 3000
150 LET x=0: LET y=50: REM MOVE Plane,x,y
160 LET x=255: LET a=30: REM MOVE Enemy,x,a
170 GO SUB 2000: GO TO 170
1000 LET a=0: LET b=176
1010 REM MOVE Plane,a,b\ENABLE Plane
1020 REM ALL Bomb\MOVE Bomb,a,b
1030 REM ENABLE Bomb
1040 REM MOVE Enemy,a,b\ENABLE Enemy
1050 CLS
1060 FOR a=0 TO 7
1070 PRINT PAPER a;: REM FILL
1080 BEEP .1,a*5: NEXT a
1090 PAUSE 25: FOR a=60 TO 0 STEP -1: BEEP .005,a: NEXT a
1100 FOR c=0 TO 1000 STEP 20
1110 LET a=10: LET b=3: LET d=50
1120 REM SOUND a,b,c,d
1130 NEXT c
1140 LET a$="SCORE:"+STR$ Score
1150 LET x=0: LET y=50: LET t=2: LET w=3
1160 REM TEMPS\LARGE
1170 IF Hi>Score THEN GO TO 1200
1180 LET Hi=Score: LET a$="A New HIGH SCORE"
1190 LET x=60: LET y=100: LET t=2: LET w=1: PRINT INK 1;: REM LARGE
1200 PRINT #0; FLASH 1;"          A New Level? [y/n]   "
1210 IF INKEY$<>"" THEN GO TO 1210
1220 IF INKEY$="n" OR INKEY$="N" THEN GO TO 1500
1230 IF INKEY$<>"y" AND INKEY$<>"Y" THEN GO TO 1220
1240 INPUT "New Level? ";Level
1250 IF Level<0 OR Level>3 OR Level<>INT Level THEN GO TO 1240
1260 GO TO 90
1500 INPUT INKEY$: PRINT #0; FLASH 1;"        Another Game? [y/n]   "
1510 IF INKEY$<>"" THEN GO TO 1510
1520 IF INKEY$="y" OR INKEY$="Y" THEN LET Score=0: LET z=1: GO TO 100
1530 IF INKEY$<>"n" AND INKEY$<>"N" THEN GO TO 1520
1540 LET a$="OK": LET w=16: LET t=22
1550 CLS
1560 LET x=0: LET y=0: REM TEMPS\LARGE
1570 LET a=21: LET b=31: REM GET x,y,a,b,a$
1580 FOR a=0 TO 21: LET b=a*.6875
1590 REM PUT a,b,a$
1600 PAUSE 5: NEXT a
1610 LET a=INT (RND*8): PAPER a: BORDER a: CLS : BEEP 1,-10
1620 GO TO 1610
2000 LET a$=INKEY$: IF a$="" THEN RETURN
2010 IF a$="6" THEN LET y=y+1+(Level<2): LET Score=Score-2
2020 IF a$="7" THEN LET y=y-1-(Level<2): LET Score=Score-10
2025 PRINT AT 0,26;Score;"  "
2030 IF y<20 THEN LET y=20
2032 IF y>168 THEN LET y=168
2035 REM MOVE Plane,COLUMN Plane,y
2040 IF a$<>"0" THEN RETURN
2050 REM USE Bomb,z
2060 LET z=z+1: IF z=4 THEN LET z=1
2070 REM LET a=LINE Plane\LET b=COLUMN Plane\LET c=LINE Bomb
2075 IF c<>176 THEN RETURN
2080 LET a=a+10: LET c=(INT ((c+4)/8))-32*(c>250): REM MOVE Bomb,b,a
2090 RETURN
3000 FOR a=2 TO 31: LET b=INT (RND*10)+1: IF RND>.8 THEN GO TO 3040
3010 LET d=INT (RND*5): FOR c=21 TO 21-b STEP -1
3020 PRINT AT c,a; INK d; BRIGHT RND;"■": BEEP .005,c+25: NEXT c
3030 PRINT AT c,a; INK d;"■"
3040 NEXT a: RETURN
4000 REM LMTPARAM
4010 IF h$="plane" THEN GO TO 5000
4015 IF h$="enemy" THEN GO TO 4500
4020 LET o=176: REM LET p=CURRENT h$\USE h$,h\MOVE h$,COLUMN h$,o\ENABLE h$\USE h$,p
4030 CONTINUE
4500 REM LET o=LINE enemy
4510 LET o=o+11+INT (RND*6): IF o>=150 THEN LET o=150
4520 IF o<20 THEN LET o=20
4530 LET p=255: REM MOVE enemy,p,o\ENABLE enemy
4540 CONTINUE
5000 REM LET y=LINE Plane
5010 LET p=0: LET y=y+4: IF y>=158 THEN GO TO 5500
5020 REM MOVE Plane,p,y\ENABLE Plane
5030 LET Score=Score-1: PRINT AT 0,26;Score;"  "
5040 BEEP .005,60: CONTINUE
5500 LET a=176: LET b=0: REM MOVE Plane,b,a\ENABLE Plane
5510 REM MOVE Enemy,b,a\ENABLE Enemy
5520 REM ALL Bomb\MOVE Bomb,b,a\ENABLE Bomb
5530 POKE 23681,0: CLS
5540 LET a$="YOU HAVE LANDED"
5550 LET w=2: LET t=1: LET x=0: LET y=0
5560 PRINT INK 2;: REM LARGE
5570 LET Score=Score+200
5580 GO TO 1090
6000 REM INTPARAM
6010 IF h$="bomb" OR i$="bomb" THEN GO TO 7000
6020 IF h$="plane" OR i$="plane" THEN POKE 23681,0: GO TO 1000
6030 LET p=255: LET o=50: REM MOVE enemy,p,o\ENABLE enemy
6040 CONTINUE
7000 IF h$="enemy" OR i$="enemy" THEN GO TO 7500
7005 IF i$="bomb" THEN LET h=i
7010 LET o=176: REM LET p=CURRENT Bomb\USE Bomb,h\LET q=LINE Bomb\LET r=COLUMN Bomb\MOVE Bomb,COLUMN Bomb,o\ENABLE Bomb\USE Bomb,p
7020 LET q=INT (q/8): LET r=INT (r/8): IF r>31 THEN LET r=31
7025 IF q>21 THEN LET q=21
7030 LET p=q+INT (RND*5)+1: IF p>21 THEN LET p=21
7035 FOR o=q TO 10 STEP -1: PRINT AT o,r-1+(r=0);" ";AT o,r;" ";AT o,r+1-(r=31);" ": BEEP .01,o+30: NEXT o
7040 FOR o=q TO p: PRINT AT o,r-1+(r=0);" ";AT o,r;" ";AT o,r+1-(r=31);" ": BEEP .01,o+30: NEXT o
7070 LET Score=Score+8-(Level*2): PRINT AT 0,26;Score;"  "
7080 CONTINUE
7500 LET o=50: REM MOVE Enemy,COLUMN Enemy,o\ENABLE Enemy
7510 IF h$="bomb" THEN LET i=h
7520 REM LET p=CURRENT Bomb\USE Bomb,i\MOVE Bomb,COLUMN Bomb,o\ENABLE Bomb\USE Bomb,p
7530 CONTINUE
8000 LET a$="BOMBER": LET x=8
8010 LET y=0: LET t=2: LET w=5
8020 PRINT PAPER 5; BRIGHT 1;"
8030 REM LARGE
8040 PLOT 0,160: DRAW 255,0
8050 LET a$="  A Game using"
8060 LET x=0: LET y=25
8070 LET t=1: LET w=2
8080 REM TEMPS\LARGE
8090 PLOT 0,0: DRAW 255,0
8100 DRAW 0,175: DRAW -255,0
8110 DRAW 0,-175: LET t=3
8120 LET w=6: LET x=8
8130 LET y=35: LET a$="FIFTH"
8140 PRINT INK 2;: REM LARGE
8150 LET t=2: LET w=1
8160 LET x=55: LET y=65
8170 LET a$="By RICHARD TAYLOR"
8180 PRINT INK 1;: REM LARGE
8190 PRINT AT 12,5;"Key 6 to move down"
8200 PRINT AT 14,5;"Key 7 to move up"
8210 PRINT AT 16,5;"Key 0 to drop a bomb"
8220 PRINT AT 18,3;"  You must clear a path to";AT 19,3;"land on."
8230 LET a=3: REM OBJECT Bomb,a
8240 LET a=1: REM OBJECT Plane,a
8250 REM OBJECT Enemy,a
8260 REM PRINT Bomb,w
8270 REM PRINT Plane,w\PRINT Enemy,w
8280 LET a=1: LET d=2: LET b=3: LET c=6
8290 REM SPEED Bomb,b,c
8300 REM SPEED Plane,a,a
8310 REM SPEED Enemy,d,a
8320 PRINT INK 2;: REM COLOUR Bomb
8330 PRINT INK 1;: REM COLOUR Enemy
8340 LET a=7: REM VECTOR Bomb,a
8350 LET a=4: REM VECTOR Plane,a
8360 LET a=12: REM VECTOR Enemy,a
8370 FOR c=3 TO 13 STEP 10
8380 FOR a=0 TO 500 STEP 10
8390 LET b=5: LET d=80
8400 REM SOUND b,c,d,a
8410 NEXT a: NEXT c
8420 PAUSE 100
8430 BEEP .2,-12: BEEP .2,-10: BEEP .2,-8: BEEP .2,-12: BEEP .2,-12: BEEP .2,-10: BEEP .2,-8: BEEP .2,-7: BEEP .2,-5: BEEP .2,-5: BEEP .2,-8: BEEP .2,-7: BEEP .2,-5: BEEP .3,-5
8440 PAUSE 30
8450 FOR a=0 TO 7: PAPER a
8460 INK 9: PRINT PAPER a-1+8*(a=0); INK 8;: REM REPLACE
8470 LET b=40: LET c=5: LET d=0: LET e=90+a
8480 REM SOUND b,c,d,e
8490 NEXT a: PAPER 7: INK 0
8500 LET a$="   Press any key to continue   "
8510 PRINT #0;AT 1,0; BRIGHT 1;a$
8520 PAUSE 5: LET a$=a$(2 TO )+a$(1)
8530 IF INKEY$="" THEN GO TO 8510
8540 CLS
8550 PRINT AT 17,0; FLASH 1; BRIGHT 1;"SELECT LEVEL:"
8560 PRINT "0 - Easy"
8570 PRINT "1 - Medium"
8580 PRINT "2 - Hard"
8590 PRINT "3 - Very Hard"
8600 INPUT "Please Select:";Level
8610 IF Level<0 OR Level>3 OR Level<>INT Level THEN GO TO 8600
8615 REM ERASE Plane
8620 RETURN
9000 RESTORE
9010 FOR a=USR "a" TO USR "a"+47
9020 READ b: POKE a,b: NEXT a
9030 RETURN
9040 DATA 0,0,0,0,56,124,124,56
9050 DATA 255,153,153,255,255,153,153,255
9060 DATA 24,60,126,255,255,153,153,255
9070 DATA 0,152,145,159,223,153,153,255
9080 DATA 0,0,249,35,255,255,16,0
9090 DATA 0,0,159,196,255,255,4,0
9500 SAVE "Bomber" LINE 9990: SAVE "Data"CODE 61030,4335
9990 CLEAR 61029: LOAD ""CODE
9999 RUN
```

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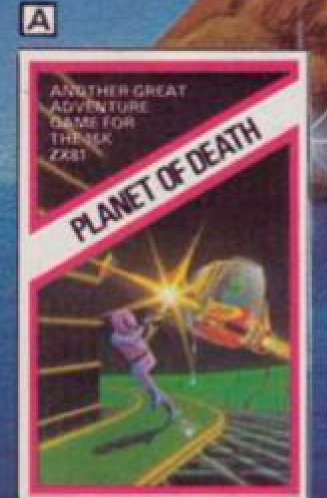
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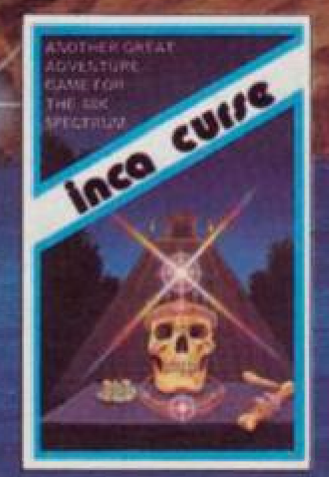


A



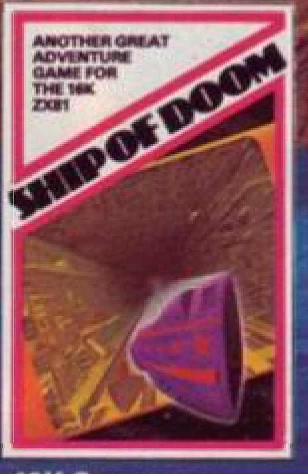
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16K ZX81
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B



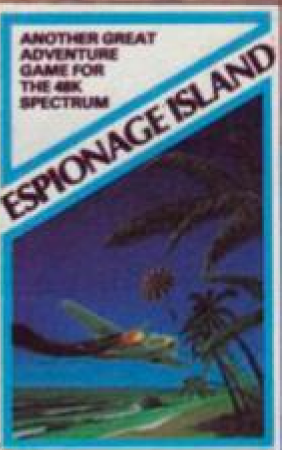
48K Spectrum
16K ZX81
You are in the middle of a South American jungle when you stumble across a strange Inca temple. Enter it to collect treasure and then try to return. But beware don't let greed be your downfall.

C



48K Spectrum
16K ZX81
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D



48K Spectrum
16K ZX81
You have to survive an engine failure while flying over an apparently uninhabitated island in the South Atlantic. Use your wits to harass the enemy, but treat the beautiful native women with respect, to escape from the island and return to an allies aircraft carrier.

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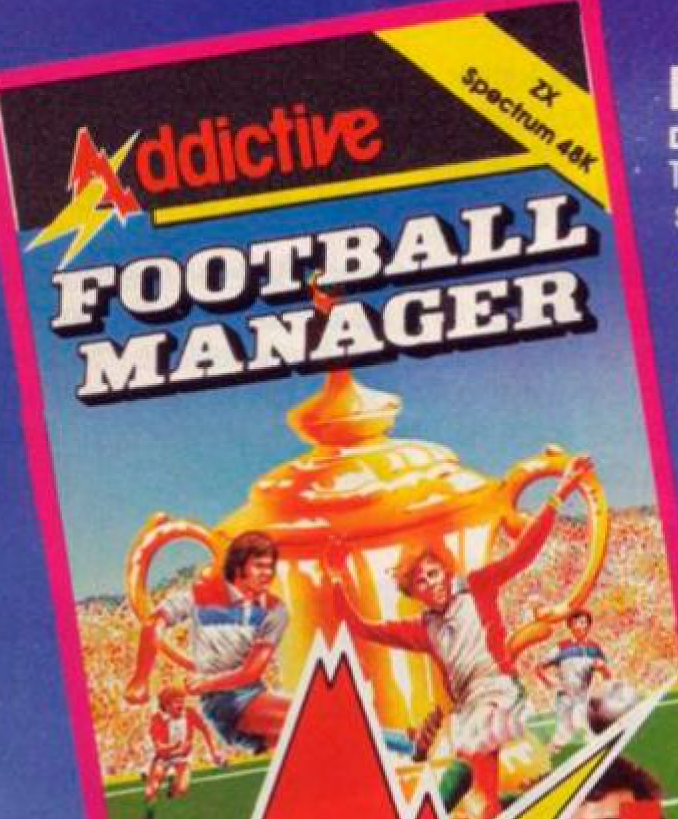
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Addictive



*ZX81 Chart, Home Computing Weekly 16.8.83

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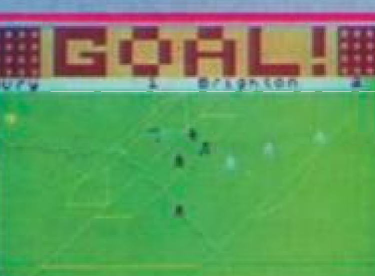
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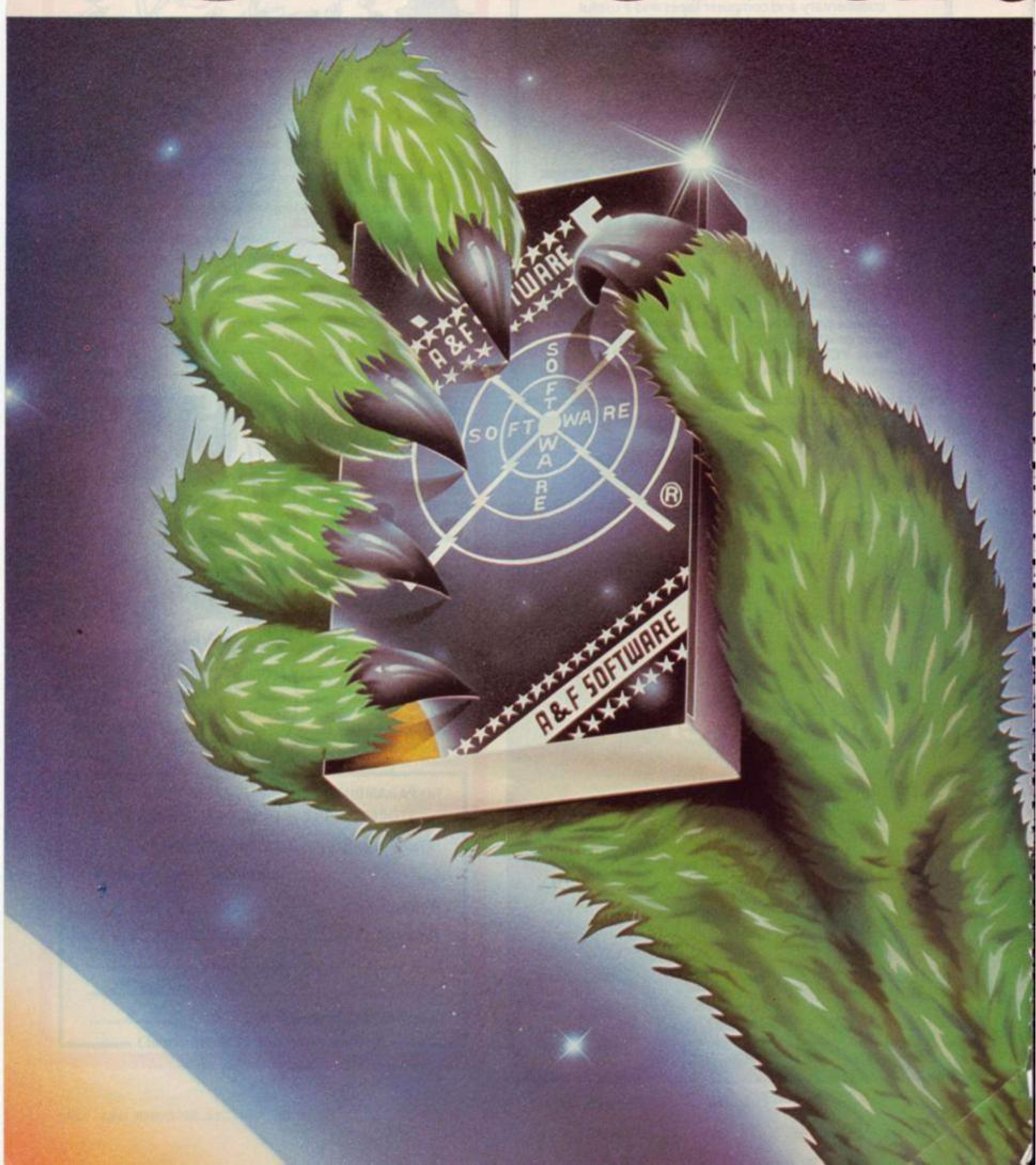
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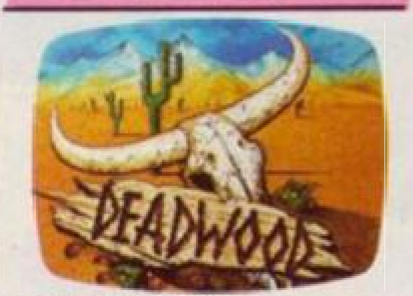


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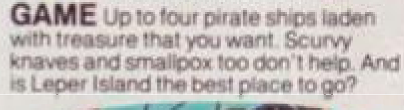
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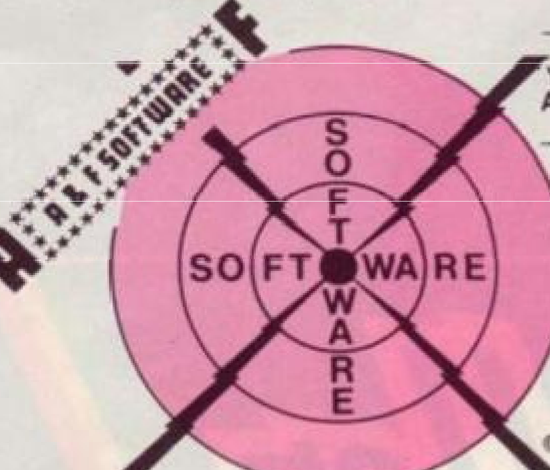
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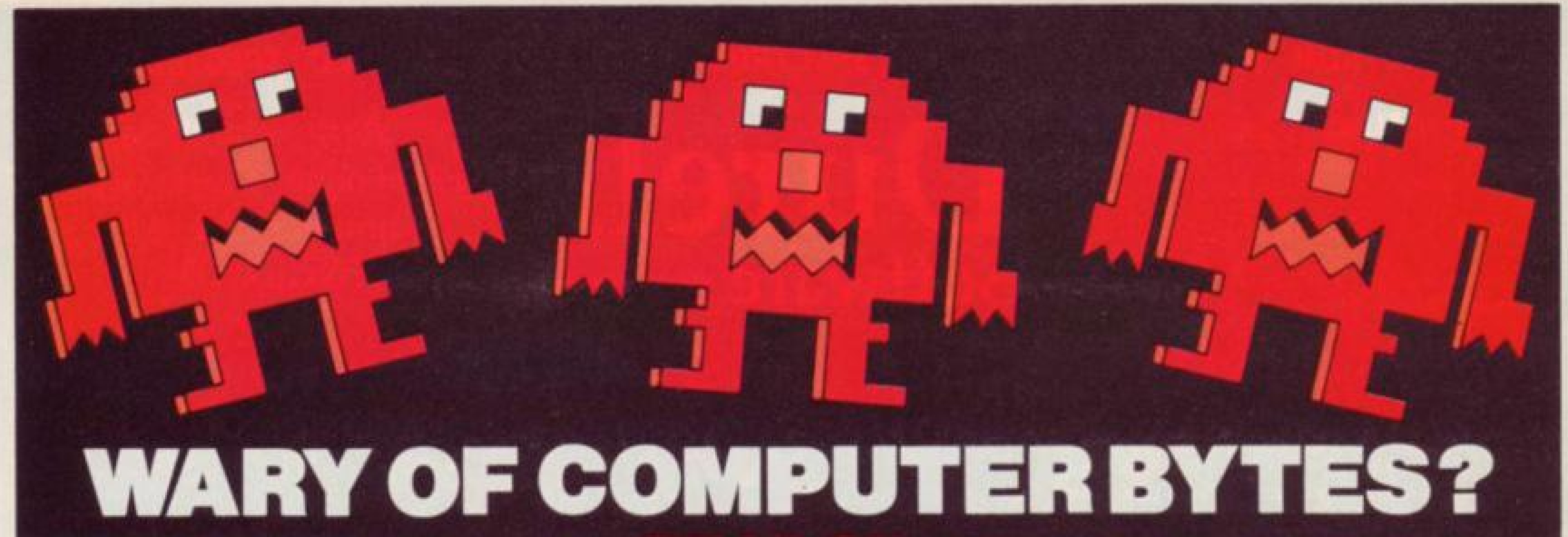
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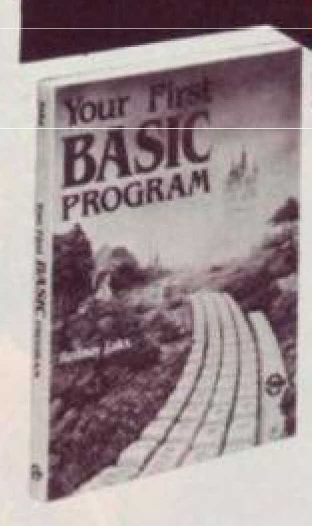
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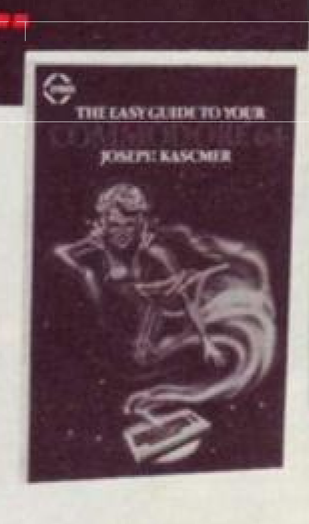
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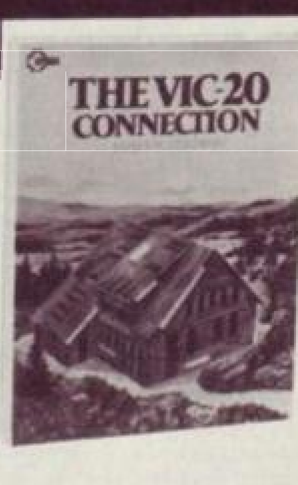
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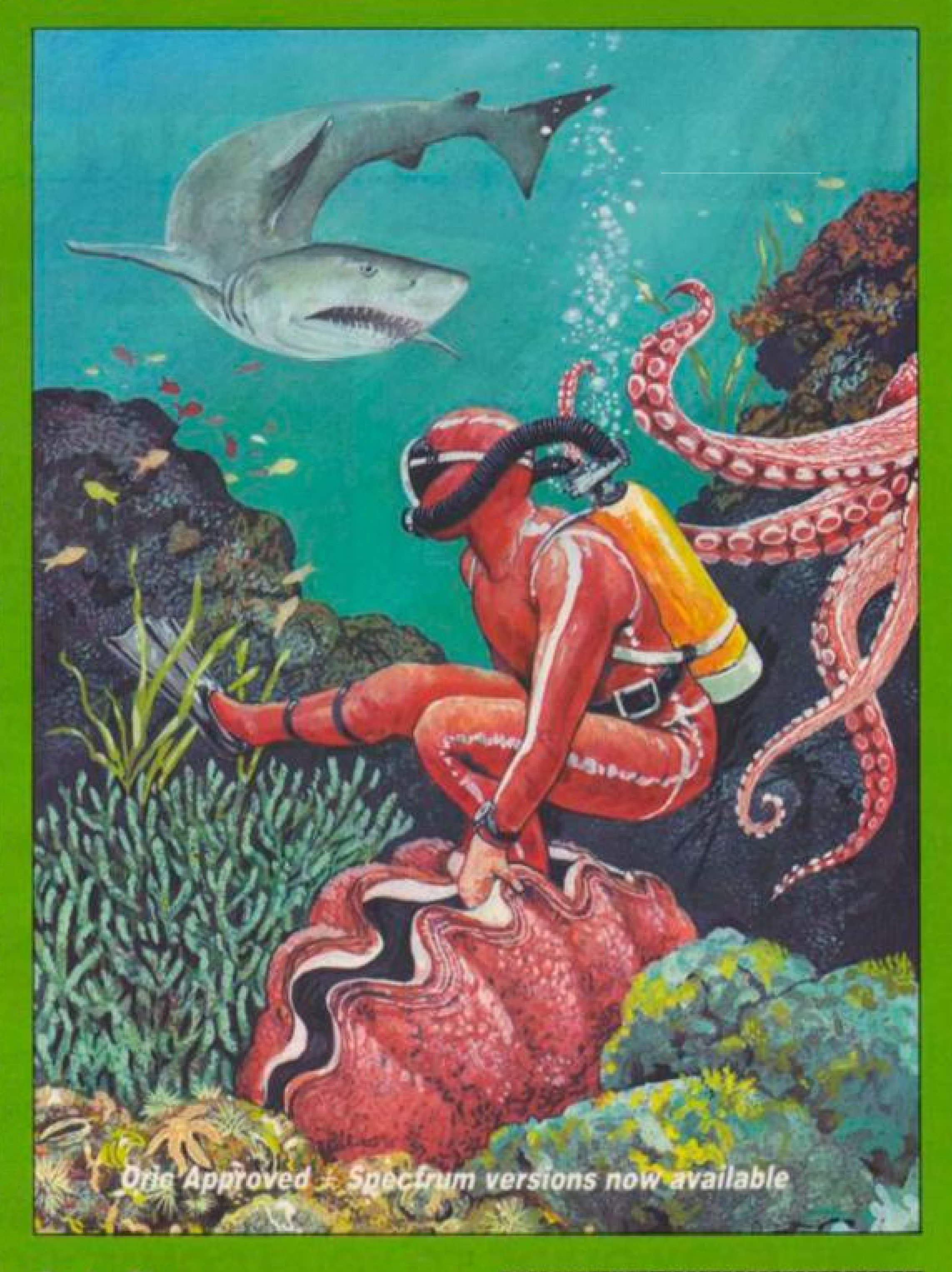
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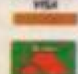
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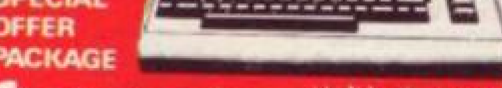
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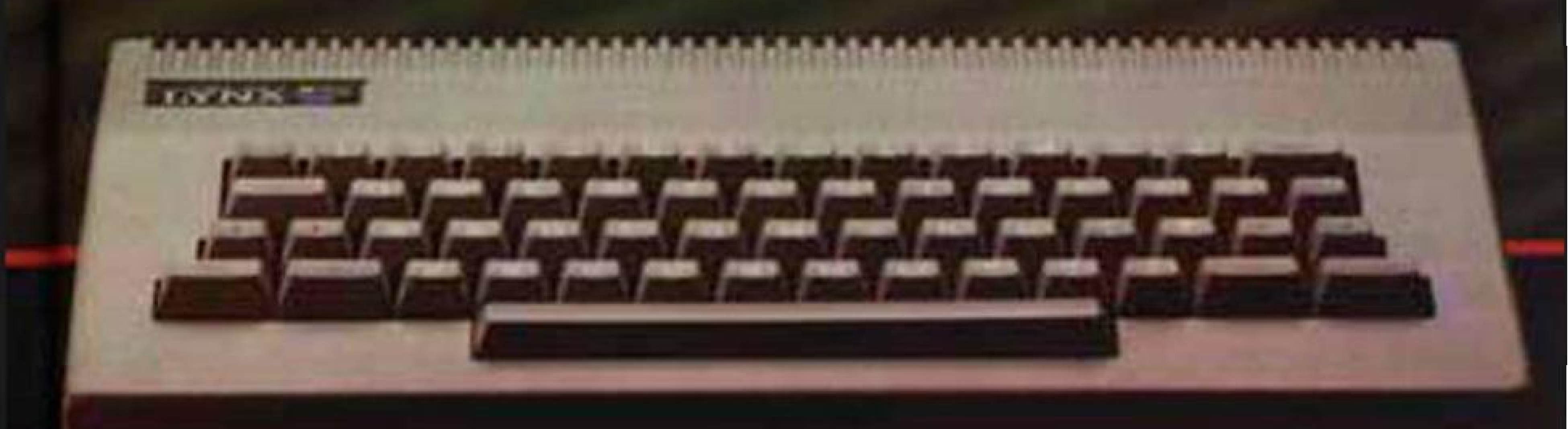
Probably the single most important aspect of Camputers' Lynx is its expandability.

From the start the Lynx was designed to be upgraded – internally. From 48K, to 96K, to a

48K Lynx £225 96K £299 128K £445

Lynx micro-computers, peripherals and software are available from selected nationwide dealer network. For your nearest stockist, telephone 0223-315063.

YOU WON'T HAVE TO BIN A LYNX.



fully professional 128K – and beyond.

The 128K Lynx (available December) with additional Disk Drives opens the door to the exciting world of CP/M* where you will find a vast range of ready made small business programs from famous software houses.

You can buy into the Lynx system at a level that suits you and your family and be assured that when you want to move on to bigger things you won't be left with a bin full of electronic junk.



EXPANDABLE NOT EXPENDABLE

SIMPLY CREATIVE

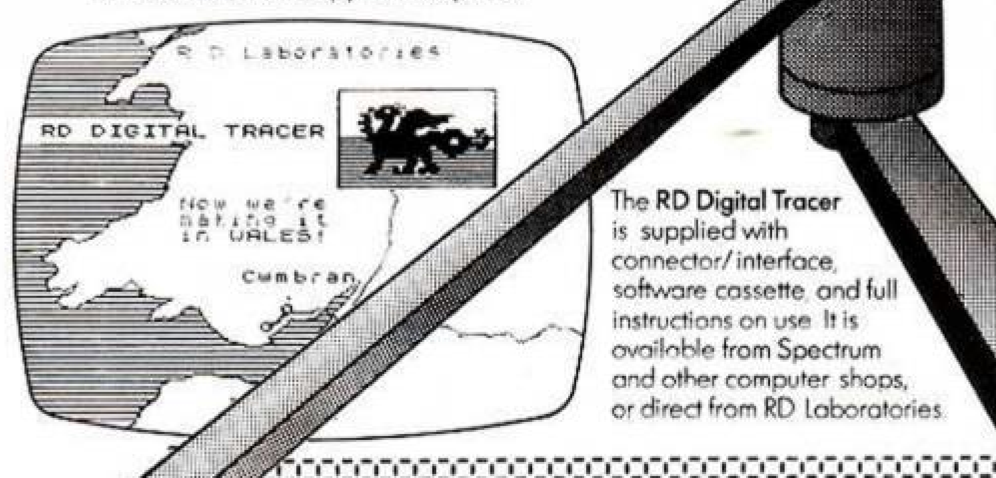


The RD Digital TRACER

High resolution colour graphics facilities on micros provide outstanding opportunities for creative presentation of complex or irregular images. Maps, technical drawings, illustrations, even personalities can be accurately reproduced. But full use of these facilities is inhibited by the tedious and time-consuming plotting of individual coordinates.

The RD Digital Tracer solves the problem of tedious plotting by providing genuinely instant transfer from original drawings to display file. But a Tracer does more than that . . .

Unretouched hard copy from ZX printer



The **RD Digital Tracer** is supplied with connector/interface, software cassette, and full instructions on use. It is available from Spectrum and other computer shops, or direct from RD Laboratories.

● Instant Full Colour Image Transfer and Scaling

Faithful reproduction of any shape is produced on display file immediately, simply by moving the head of the Tracer over the original outline. Fast PAPER and INK colour change is provided. The software also includes an infinitely variable scaling routine.

● Special Constructions

Circles, lines, angles and rectangles can be rapidly sampled and applied, based on any two Tracer input points. So windows and wheels, bar charts and frames, and so on, can be added to outlines within seconds.

● Colour Fill and Texture

Fast colour fill, or a choice of colour hatching can be added within outlined areas on the display.

● Text and Symbol Positioning

Text, or user-defined symbols, can be positioned as desired, under the control of the tracing head.

● Display, Print, SAVE and Re-trace

Besides colour display, drawings may be printed, and SAVED on cassette (or video recorder). And with the re-trace routine amazing animated presentations can be made.

BBC Micro Tracer

This Tracer version operates with the BBC Micro Model B, or ADC converted Model A computers. It is suitable for all colour modes including Teletext, and a "colour palette", which can be modified whilst the program is running, relieves the user of complex GCOL colour specification. Accuracy to 1% is achieved over a full A3 tracing area. Software is provided for both serial and parallel printers. The price of **£69.95** includes P&P and VAT.

ZX Spectrum Tracer

The ZX Spectrum Tracer (compatible with ZX81) operates with all ZX Spectrum variants and accessories, including Sinclair printer and Microdrive. Original areas up to A4 may be traced with a typical accuracy greater than 2%. The price of **£55.50** includes P&P and VAT.

Please send me ____ Tracer(s) for BBC Micro at **£69.95** each, total £ ______

____ Tracer(s) for ZX Spectrum at **£55.50** each, total £ ______

Name ______

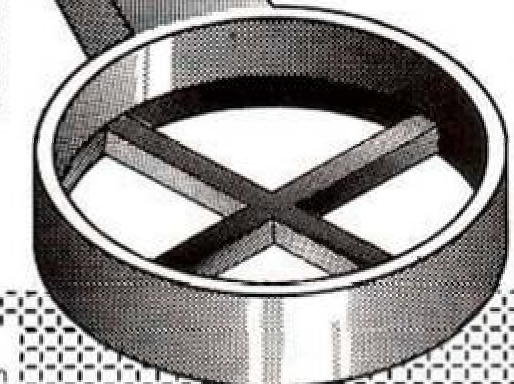
Address ______

Cheque, payable to RD Laboratories Ltd, for £ ______ enclosed

Send to: Dept YC RD Laboratories Ltd 20 Court Road Estate Cwmbran Gwent NP44 3AS. Allow 28 days for delivery.

Economic Micro Control

RD Laboratories also supply the RD 8100 SYSTEM for automatic measurement, test and control. The modular-based RD 8100 SYSTEM is already widely used in many applications – from scientific experimentation to small-scale energy management systems.



For further product details please send your name, address and postage stamp to RD Laboratories Ltd 20 Court Road Estate Cwmbran Gwent NP44 3AS Tel Cwmbran (06333) 74333 Telex 437240

Can you combat the ALIEN ATTACK?





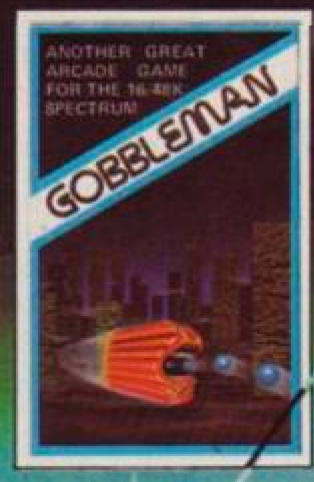


48K SPECTRUM ONLY £4.95
Your spaceship must survive by destroying asteroids that plummet through space at you. Your aim is to shatter and re-shatter the cosmic debris, while destroying the nasty little flying saucers.



NEW

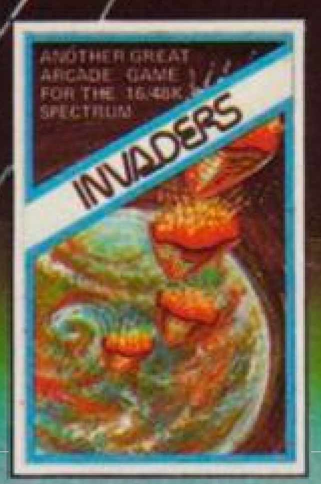
48K SPECTRUM ONLY £5.95
The real 3-D tank battle game. You must travel across the flat plains and battle with the enemy 3-D tanks, supertanks and flying saucers. Includes a battle readout and radar above your sights. Full 3-D explosion, burning, firing and moving effects.



16K/48K ZX/Spectrum £4.95
16K ZX81 £3.95
You are doomed to roam through the haunted maze until you are eaten alive by the ravenous ghost. Similar to the classic arcade game.



16K/48K Spectrum £4.95
16K ZX81 £3.95
This full colour, hi-resolution (Spec) machine code program is as exciting as the classic arcade game. There are nine levels of play in which you must defend yourself against invisible Galaxian fighters which swoop down to bomb you.

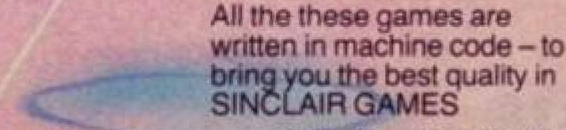


16K/48K Spectrum £4.95
Fight the invaders as they drop, line by line, to eventually land and destroy you. This classic arcade game includes nine levels and four variations of play.



16K/48K Spectrum £4.95
16K ZX81 £3.95
In this high speed arcade game, you must blast through the alien's force field avoiding the fighters and bombers to destroy the Mother ship.

WARNING: These programs are sold according to ARTIC COMPUTING LTD's terms of trade and conditions of sale. Copies of which are availabe on request.



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MTX500: 32K RAM - £275
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MTX512

The All-Purpose System

The MTX Series is a new departure in micro-computer technology. Whether your needs as a user are for personal programming, games playing, scientific or process control, educational or business use the MTX Series is already capable or very easily adaptable to almost every application. Glance through the standard features below - you'll see what we mean.

Hardware - 32K RAM on the MTX500, 64K on the MTX512.

The MTX500 has 32K of user RAM as standard (64K on the 512), expandable to 512K plus 16K of video RAM, controlled by a separate Video Processor. Sixteen colours, 40 column text, 256 x 192 high resolution graphics with all sixteen colours available, and 32 easily moveable user defined graphics characters (Sprites) combine to make effective screen displays quick and simple to achieve. Standard outputs are centronics printer port, two joystick ports, an uncommitted I/O port, 2400 Baud Cassette port, separate TV and Video Monitor ports, 4 channel sound with hifi output plus a dedicated cartridge port. Other standard features include the Z80A processor running at 4MHz, real time clock, full moving key keyboard with 79 keys including eight 2-function keys and separate numeric pad.

Software

The MTX's 24K ROM contains several languages and routines which enable the novice or the experienced programmer to make full use of the machine. Standard languages are MTX BASIC, MTX LOGO commands, NODDY. ROM routines include an ASSSEMBLER/DISASSEMBLER with screen display of the Z80 CPU registers, memory and program,which can be manipulated from the keyboard. Machine code programs can be stepped through one instruction at a time, and easily called from within BASIC programs. A further feature is the Virtual Screen facility which enables the programmer to split the screen into a maximum of eight sections to work independently whilst maintaining all full screen facilities. Pascal is available as an add-on ROM pack.

The Disc Based Computers from Memotech

Designed to use the full power of the MTX computers the FDX and HDX make perfect business systems at prices which make perfect business sense. Both feature the CP/M operating system, giving instant access to a wide range of proven application software. Available in October these feature:

- *Full Western Digital floppy disc controller set with SASI interface for 4 drives, CP/M types 0-13.*
- *minimal latency, very high data transfer rates*
- *optional Colour 80 Column Board*
- *optional Silicon Discs (1/4 Mb) which dramatically increase the efficiency of 8 bit software to those of 16/32 bit software; increases life and reliability of mechanical drive*
- *permits single disc CP/M operation*

FDX— Floppy Disc System

1 or 2 5 1/4" Qume drives 500K unformatted, 347K formatted.

HDX—Hard Disc System

5 1/4" Qume drive, 500K unformatted, 347K formatted.
5 1/4" Winchester which may be 5, 10, or 20 Mb

All Memotech products are designed and manufactured in Oxfordshire, England



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MEMOTECH

The Complete Range

Fifteen months ago Memotech developed the first 64K Memopak, designed to maximise the capabilities of the Sinclair ZX81. Since then, using the ZX81 as a starting point, we've gone on to produce a comprehensive range of Memopaks, adding 16K and 32K memory expansions, utilities packages comprising a Word Processor, Z80 Assembler and Spreadsheet Analysis, plus Communication Interfaces, High Resolution Graphics and a professional quality Keyboard.

To complete our range of ZX81 add-ons, we are now introducing the MEMOPAK RS232 Serial Interface.

RS232 Interface

The RS232 is an all-purpose interface which allows the ZX81 not only to output to suitable serial printers, but can link up with numerous types of peripheral or even other processors.
The Interface has two main modes of operation: BASIC mode allows you to use the range of functions supplied in the RS232 EPROM within an ordinary BASIC program, and TERMINAL mode allows you to use your ZX81 as a terminal to another processor.
The EPROM functions offered permit the user to send, receive and convert bytes between ZX81 code and ASCII, as well as check the status of numerous control flags. Received or transmitted data can appear simultaneously on the screen, and received data may be printed simultaneously.

£39.95 inc. VAT

Memopak Centronics I/F

The BASIC commands LPRINT, LLIST and COPY are used to print on any CENTRONICS type printer. All ASCII characters are generated and translation takes place automatically within the pack. Reverse capitals give lower case. Additional facilities allow high resolution printing.

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Memopak HRG

This pack breaks down the constraints imposed by operating at the ZX81 character level and allows high definition displays to be generated. All 248 × 192 individual pixels can be controlled using simple commands, and the built in software enables the user to work interactively at the dot, line, character, block and page levels.

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Memocalc

The screen display behaves as a 'window' on a large sheet of paper on which a table of numbers is laid out. The maximum size of the table is determined by the memory capacity, and with a Memopak 64K a table of up to 7000 numbers with up to 250 rows or 99 columns can be specified.

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Memotext

Text is first arranged in 32 character lines for the screen with comprehensive editing facilities. On output the user simply chooses the line length required for printing and the system does the rest. Used with the Memopak Centronics Interface, the Word Processor makes available printout with 80 character lines, upper and lower case and single and double size characters.

£29.90 inc. VAT

Memopak Memory Extensions

For those just setting out on the road to real computing, these packs transform the ZX81 from a toy to a powerful computer. Data storage, extended programming and complex displays all become feasible. Further details available on request.

16K Memopak £24.95 32K Memopak £34.95
64K Memopak £49.95 Prices inclusive of VAT

MEMOPAKS ARE AVAILABLE AT MAIN BRANCHES OF WH SMITH and JOHN MENZIES

Z80 Assembler

The Assembler allows you first to code and edit a source program in the Z80 language, and then assemble it into machine code. You can now write flexible and economic programs. The Editor mode allows you to code directly in the right format, manipulate individual lines and control the exact placing of source and machine code. Routines may be merged or listed (even to a commercial printer using our Centronics Interface). The assembler mode handles all standard Z80 mnemonics, numbers in hex or decimal, comments and user-selected labels.

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Memotech Keyboard

The Memotech plug-in Keyboard plus buffer pack takes the effort out of data entry for ZX81 users. The Keyboard has a light professional touch and is housed in an elegant aluminium case. The simple plug-in system means that you are not obliged to open up your ZX81, use a soldering iron or invalidate your ZX81 warranty.

Keyboard Buffer Pak

The Buffer Pak performs a "housekeeping" function for the Keyboard, interfacing directly with the port of your ZX81.

£34.95 inc. VAT



All Prices are inclusive of VAT, postage and packing.

To Order: Send your Name, Address, Memopaks required, plus a Cheque/Postal Order/Access/Barclaycard number (please state which) to: Memotech Limited, Station Lane Industrial Estate, Witney, Oxon. OX8 6BX. Telephone Witney 2977

We want you to be completely satisfied with your Memopak – all our products carry a 14 day money back guarantee.

SOFTWARE WITH BITE FOR commodore 64



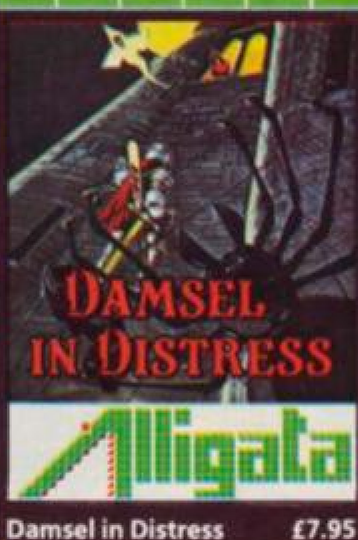
Brands £7.95

Test your skill on the Grand Prix circuit. Accelerating to breathless speeds can you overtake? Can you face the danger of night driving as the roads get narrower?



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Fuel level low. Time running out. Collect fresh fuel to stay in the air or plunge to certain agonising death.



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Menacing man-eating spiders and dreadful apparitions. Weakened by poison you must climb the battlements and rescue the princess who holds your antidote.



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Killer bats in the first wave, a myriad of asteroid discs in the second. The third wave?! ... the faster your reflexes, the more deadly the challenge.



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Cross a motorway of fast moving traffic. Traverse the rapids teeming with frog eating snakes, alligators and submerging turtles. Can you get him home? Or is it just Ugh! Splatt!



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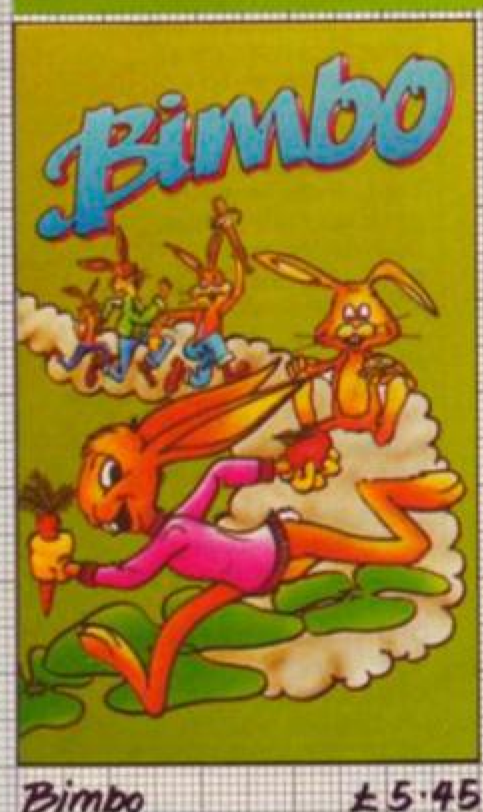
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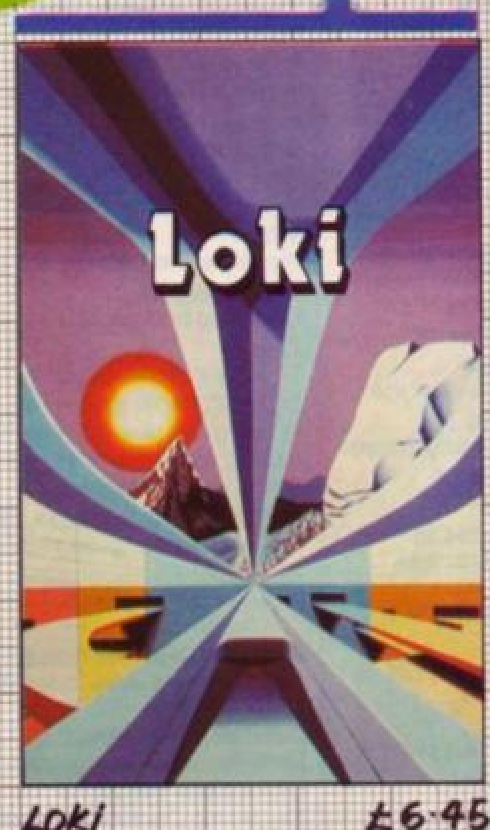
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Step into the third dimension

Take a giant step closer to reality with New Generation Software. The 3D Graphics of New Generation programs bring the screen alive and makes other games look as flat as snakes and ladders.

Spectrum owners will find that seeing is believing when they open the door on 'THE CORRIDORS OF GENON', the latest creation from New Generation. You will be saving the Universe from the evil that now controls all things. But beware – the sound of footsteps approaching could be Bogul!

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ZX81 owners must be prepared for the shock of coming face to face with the T Rex that leaps out from '3D MONSTER MAZE'. '3D DEFENDER' takes you out of this world and plunges you into space in a fast moving game to defend your home planet against alien spacecraft in a blitz of explosions, plasma blasts and photon beams.

All these exciting 3D games have been designed by Malcolm Evans, the 3D expert. They'll have you leaping out of your seat because you don't just play New Generation games, you live them.

Corridors of Genon for 48K Spectrum £5.95

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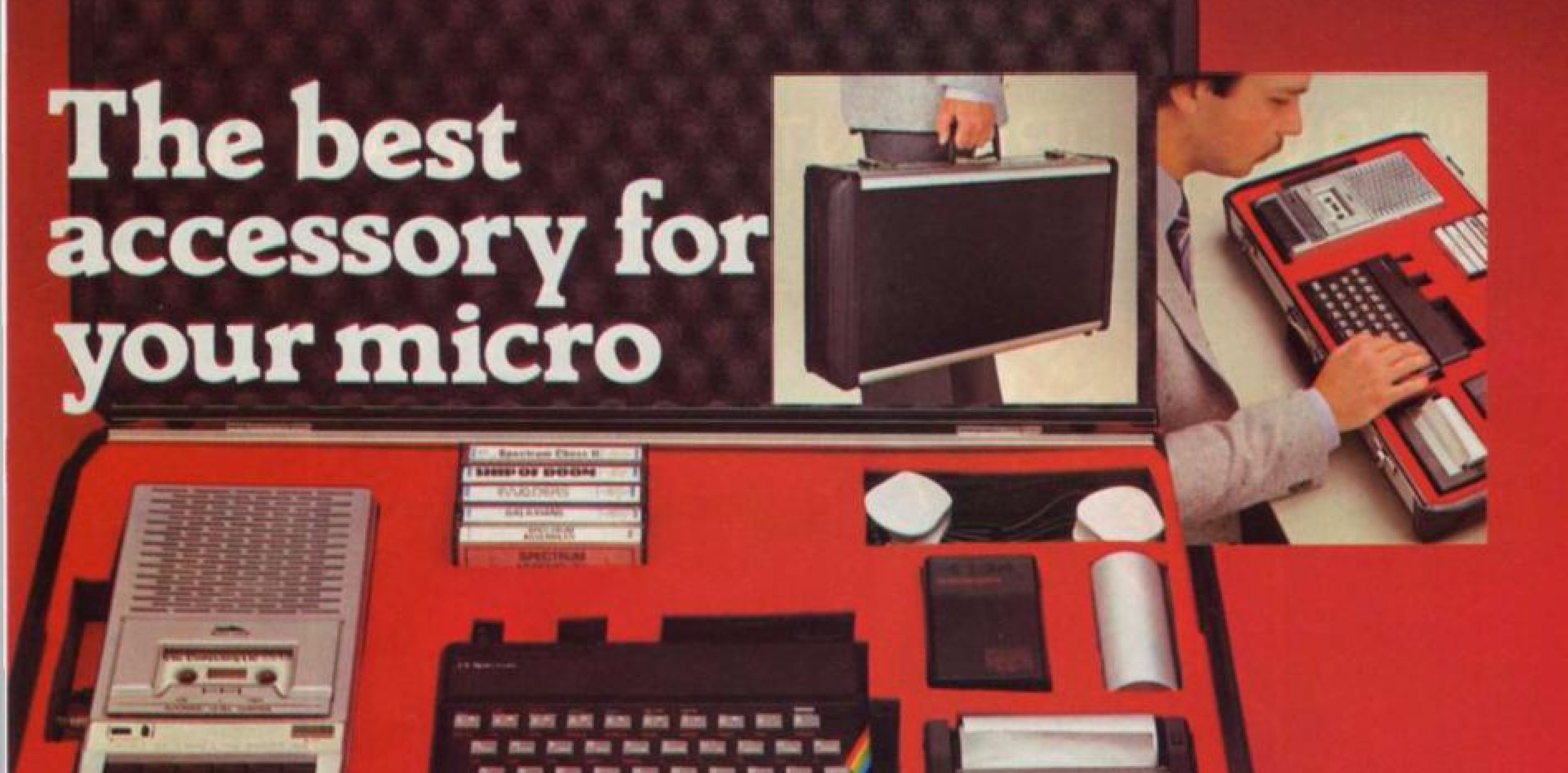
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The Rotronics Portable Case

Here is the ideal portable work station for home, school or work. Specially made for most home microcomputers, it contains your ZX81, Spectrum, Oric or VIC 20 within a smart executive style case with removable lid for convenience in use.

The individually tailored foam insert securely protects your micro, printer, cassette recorder, tapes and manuals during transit. A scalpel is provided to modify the insert for expansion units and an alternative insert can be supplied if you change your hardware in the future.

All components remain fully operational within the case via interconnections routed between the double layers of foam, so there are no unsightly leads.

This is the first case designed for easy use with each component positioned for convenient operation. The overall dimensions are 138mm x 700mm x 363mm.

Value Corner

ZX Panda



The best 16K RAM for the ZX81. Anti-wobble design with LED power indicator
16K Expandable RAM Pack £18.50 (p+p 50p)
16K Plug-in Module for above £13.95 (p+p 50p)
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Vixen Ram Cartridge

Maximum flexibility for the VIC 20
Offers standard 16K expansion plus three other switchable memory configurations
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Trade Enquiries Welcome

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- ☐ Rotronics Portable Case at £36.99 (inc £2.50 p+p) for ZX81/Spectrum/Oric/VIC 20 (Please delete as necessary)
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CHOOSING A HOME MICRO

WARNING

Choosing a home micro can be a daunting task to the newcomer, and with an ever increasing number of micros emerging on the market, even up-grading, say, from a ZX81 can be a risky and expensive exercise if the wrong decision is made. It is important to look at the real facts and specifications, and check exactly what you get for your money before choosing your micro-computer system.

THE PITFALLS

"DON'T LET THE ADD ONS ADD UP"

A number of large companies are offering packages that seem to be good value and low cost.
These offers usually have a hidden sting inasmuch as the essential accessories such as connection leads, peripherals and software often carry very high cost premiums.
e.g. software for low cost hardware usually costs between £29 and £49 for a ROM cartridge!!

CHECK THE QUALITY OF THE PRODUCT.

Raw materials are now an area where corners can be cut, and shoddy workmanship during 'building' can effect the 'up-time' of your unit.
Areas to watch out for are unreliable edge connectors, corrosion and poor quality P.C.B.s. Low quality components and bad design will seriously effect the reliability of the end product, and can lead to false economy.

DON'T BUY A GAMES MACHINE

Unless you want just games and nothing else! With a games computer you are limited.
Some computers, however, have the advantage of both games facility plus the whole world of computing to explore, as your interest and skills develop. A real computer system will allow you to expand your knowledge of the Hi-Technology world, and help earn its keep with its added uses in the field of education, communication and home business use.

SOFTWARE

Make sure the system you choose has a growing library of support software, to enable you to realize the full potential of your machine.

KEY POINTS TO LOOK FOR

● High Resolution Colour

In general most home computers have a poor graphics resolution (or detail). Check on the vertical and horizontal resolution in graphic mode and multiply the two numbers together. If the result is less than 35,000, then the graphics can hardly be considered high resolution. Without high resolution graphics displays such as those used in games tend to be "Chunky" in appearance.

● High Quality Sound

Some computers claim to provide a sound channel when in reality all that can be found inside the computer is a small buzzer controlled by electronic pulses. At the very least a sound facility should provide more than one channel and a raise channel as well (for gun shot effects in games for example). The best systems also provide envelope control of the sound channels to produce very sophisticated effects; very important for generating music. Also look for the ability to connect to external amplifiers.

● Keyboard

For accurate entry of programs and data into a computer it is important that the keyboard has a good tactile feel in operation. Coupled with acoustic feedback the user is fully aware when the computer has accepted his/her actions. Also of importance in a keyboard is layout. A standard computer keyboard layout will familiarise the user with the vast majority of computers used in the world of business and professional applications; very important if the purpose of purchasing a computer is educational.

● RAM

One of the most important features of a computer is the amount of RAM, or memory, included. In general the more powerful and exciting a computer program is the more RAM it requires. But take care, all computers are advertised quoting the total RAM used in the system. Computers use up a great deal of their own RAM for storing essential data and particularly in supporting the graphics display and the CPU. If it is less than 32K think again, is it enough?

● Computer Language

It is too dificult to program a computer in its own binary language so high level languages are used, the most popular being BASIC. However, there are a number of BASICs, some being very different from the rest. A de facto standard in the computer industry is Microsoft BASIC. Learn this one and you will be able to program in the majority of computer BASICs; such an important point if a home computer is to be used to educate your children to face the technology of the future.

● Expansion

As your interest and knowledge of computing grows, you will need a computer system that will grow with you; able to accommodate Printers, Disk-drives, Joysticks, Communications Modem, and Colour Monitor, as well as produce HI-FI sound effects.



Choosing the right system carefully will save you from throwing your money away. Check full specification, plus peripherals and software prices, before you buy. Preferably choose a Real computer system that can expand to meet your needs.

● Software

The computer you choose should have a growing selection of utility software to make the most of its capability.
Remember, computing is here to stay. You can't learn to compute on a toy, or a device which does not behave like a real computer.
In short, look out for a computer which offers all the points above, and you will be sure of getting the best value for money.

To find out which company offers you the right choice, with:-

- Good value, high specification, quality micros.
- A quality, 4 colour, plain paper printer/plotter.
- Communications Modem.
- Micro Disk Drives.
- Comprehensive and growing range of software

TURNOVER...



The right choice for real computing

ORIC-1

Before making your final choice, check any other home micro in the same price bracket, against the incredible specification of the ORIC-1.

Quality of build and materials		Real computer keyboard layout and moving keys	
Superb styling / Full colour display		High Resolution colour graphics 240 x 200 pixels	
Choice of 16K or 48K RAM		Real computer language programming – Basic / Forth	
Latest design technology and circuitry		Teletext/Viewdata compatible graphics (28 rows x 40 characters)	
Real sound – 8 octaves plus Hi-Fi output		Cassette Port & R.G.B. output.	
Centronics printer interface		Fully supported and growing software library	
Colour printer / Disk Drives		A fully expandable system for home, education & small business use	
Communications Modem		Full range of peripherals to support your system...	

ORIC-1 Setting todays standard in Quality and Price.

ORIC-1 48K £139.95 inc.VAT ORIC-1 16K £99.95 inc.VAT

All ORIC computers purchased before 31st December 1983 come with a £40 voucher off the M.R.P. of the MCP 40 Colour Printer.

MCP 40 COLOUR PRINTER £169.95.
OFFER PRICE £129.95

TANSOFT
ORIC Software

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LATEST RELEASE
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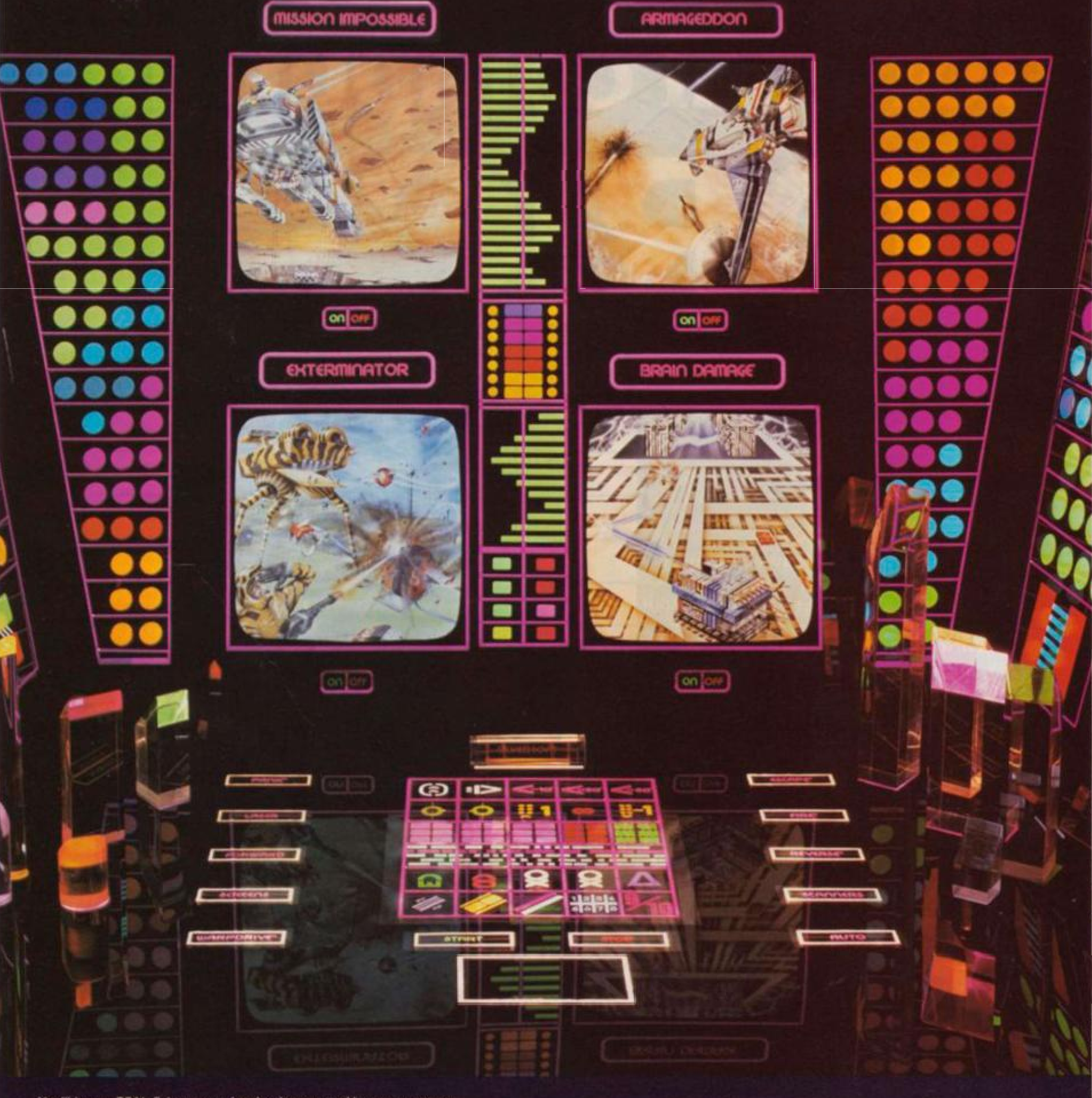
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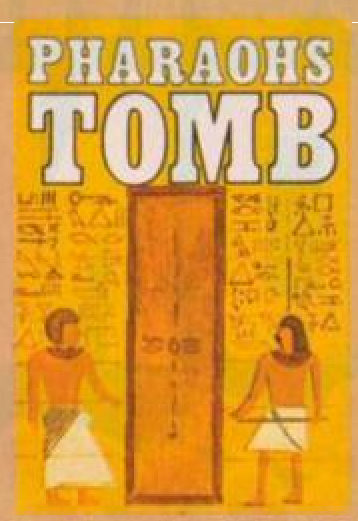
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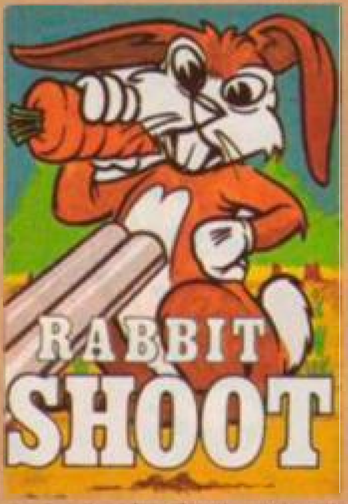


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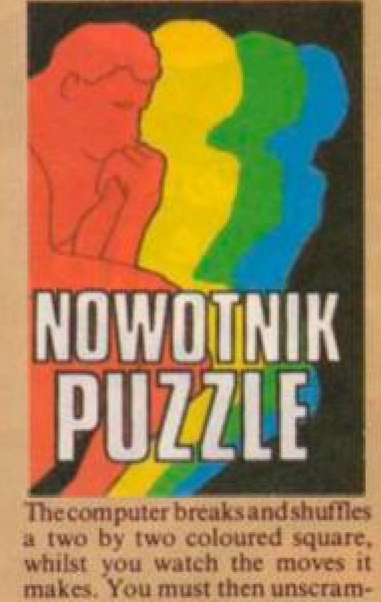
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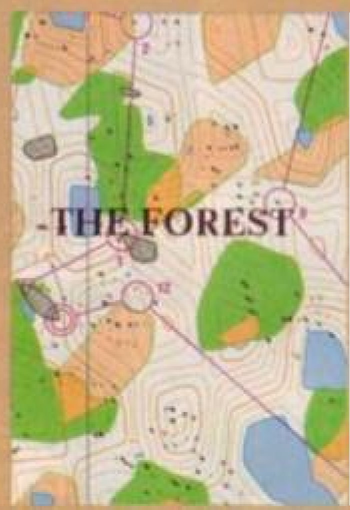
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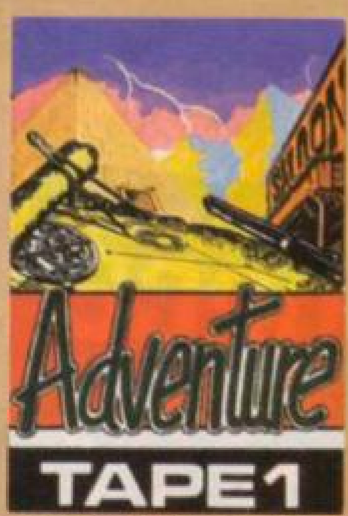


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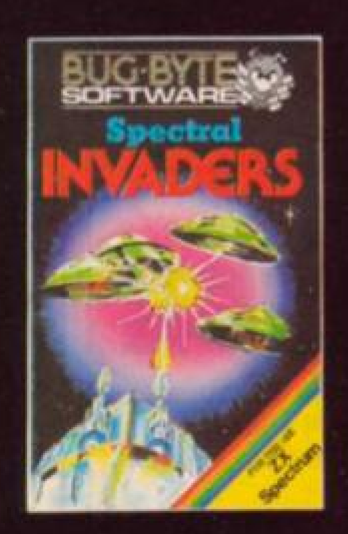
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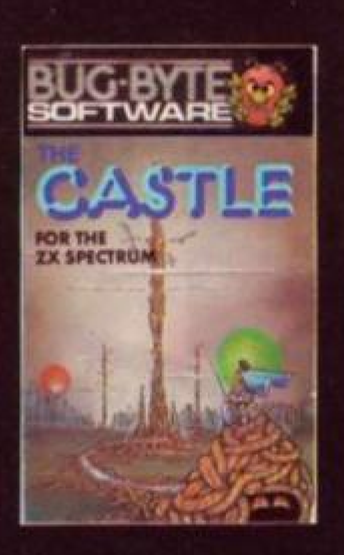


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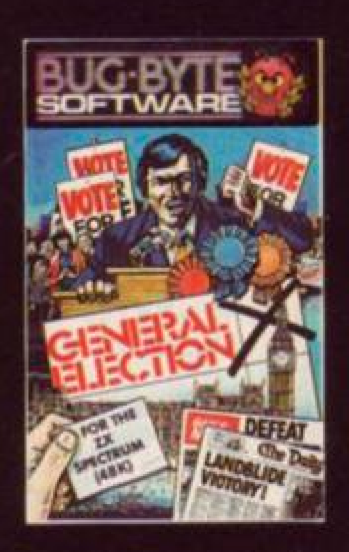

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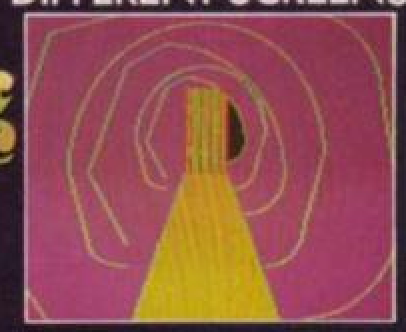
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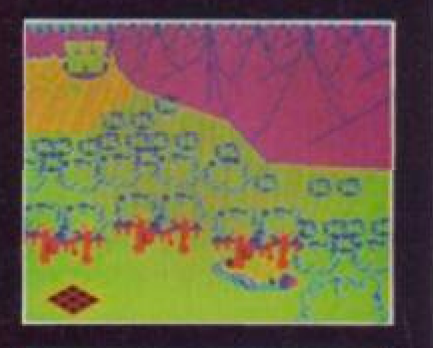
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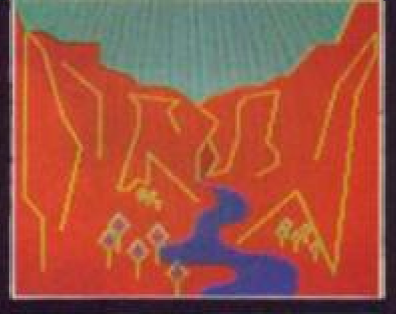


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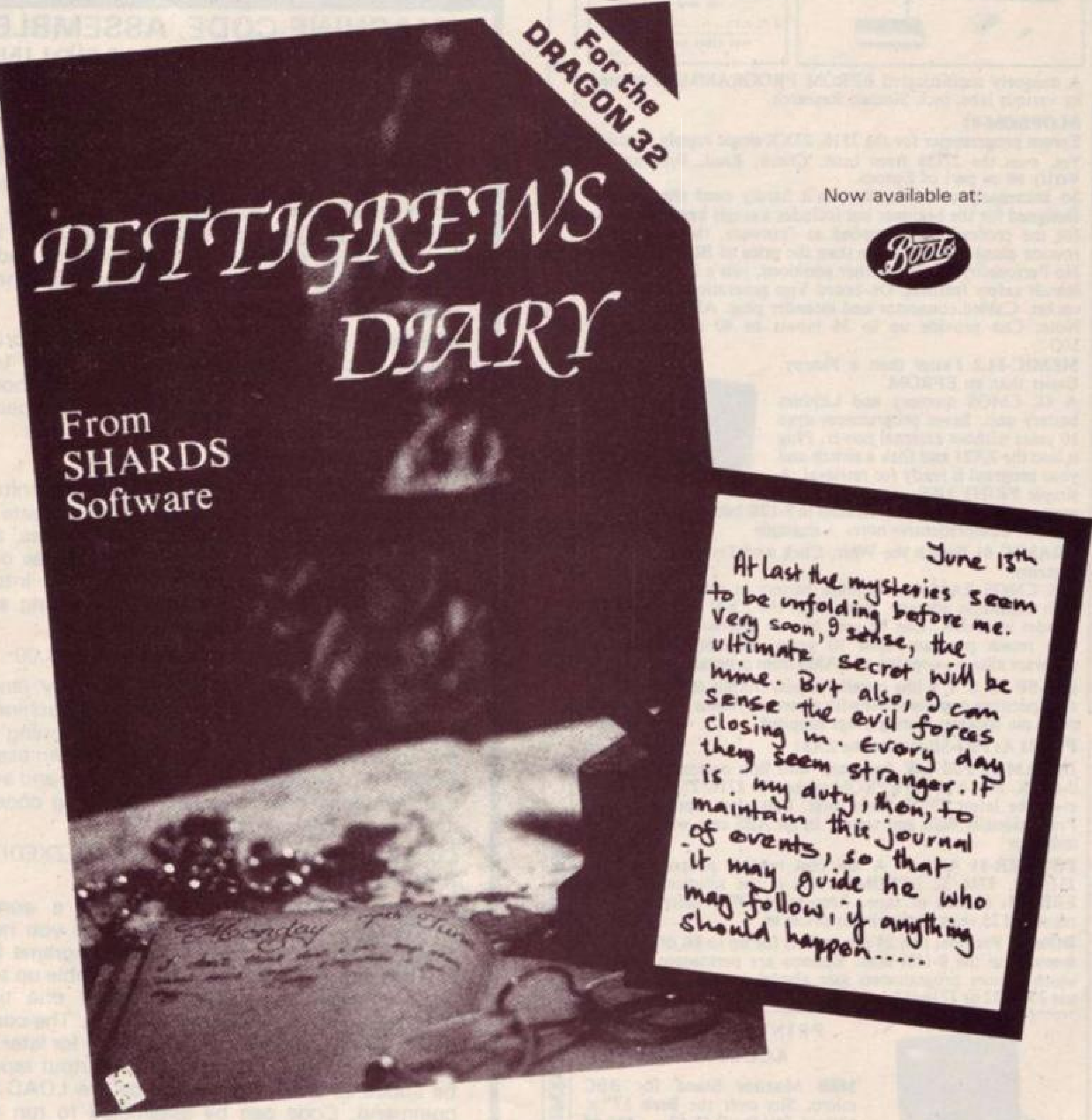
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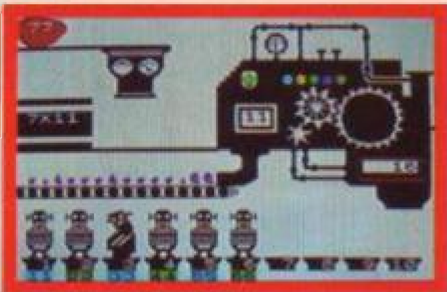
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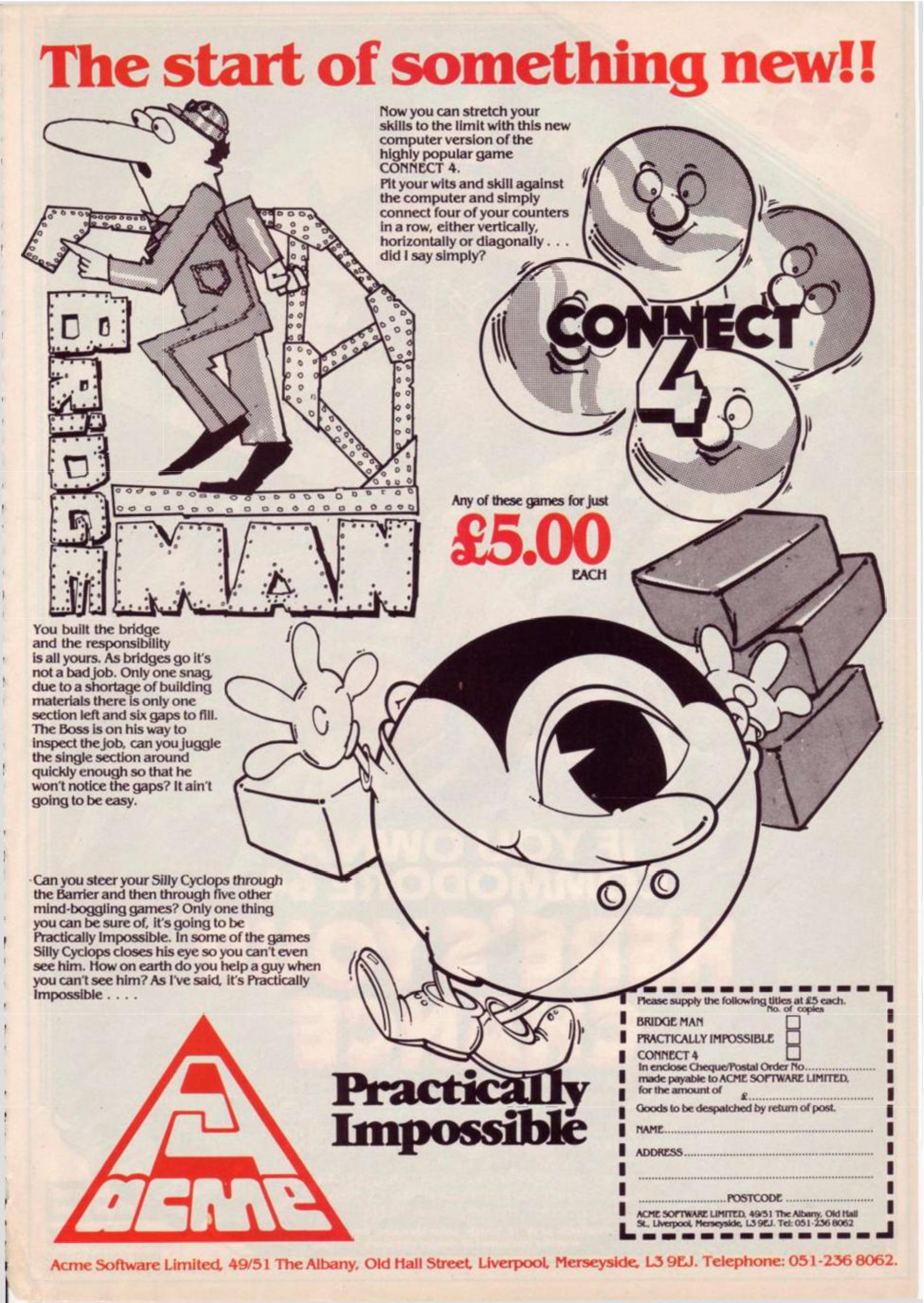
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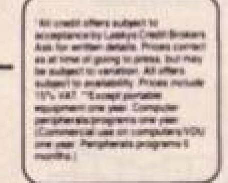
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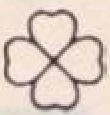
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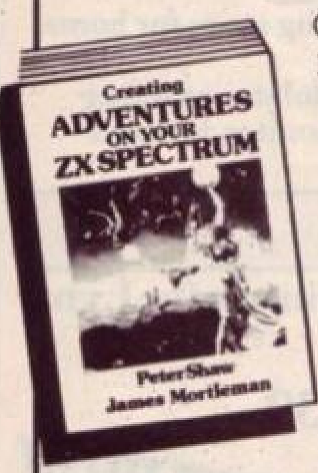
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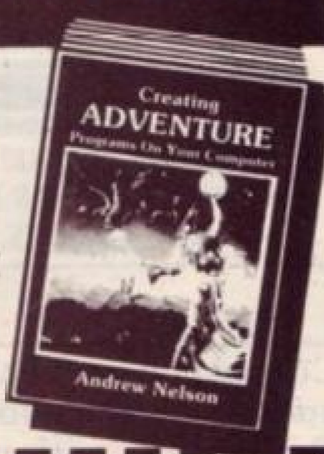
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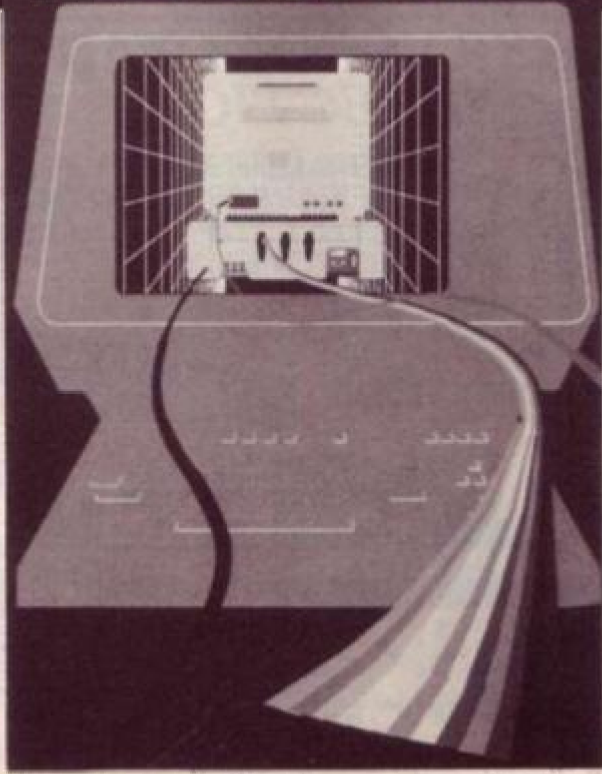
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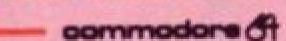
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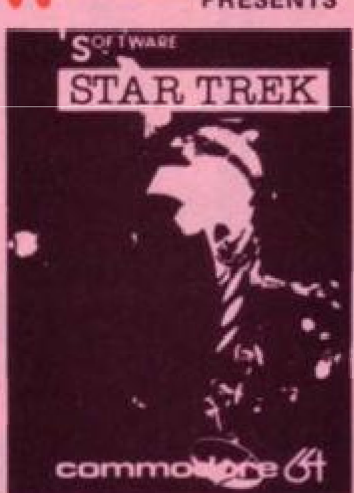


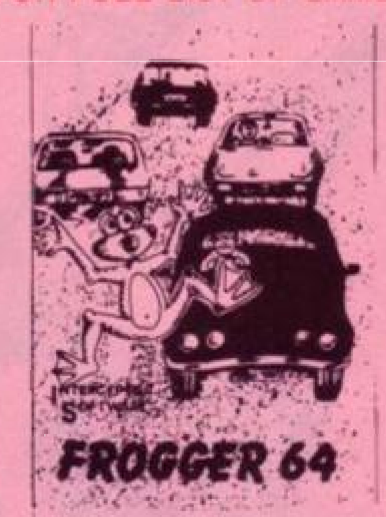
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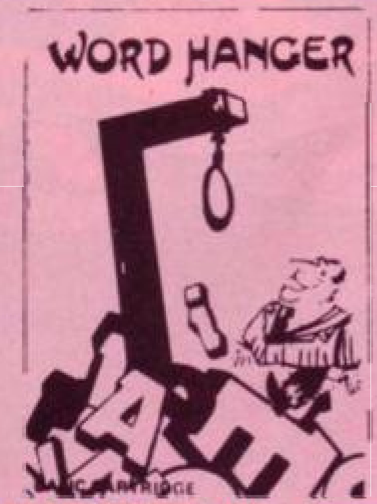
















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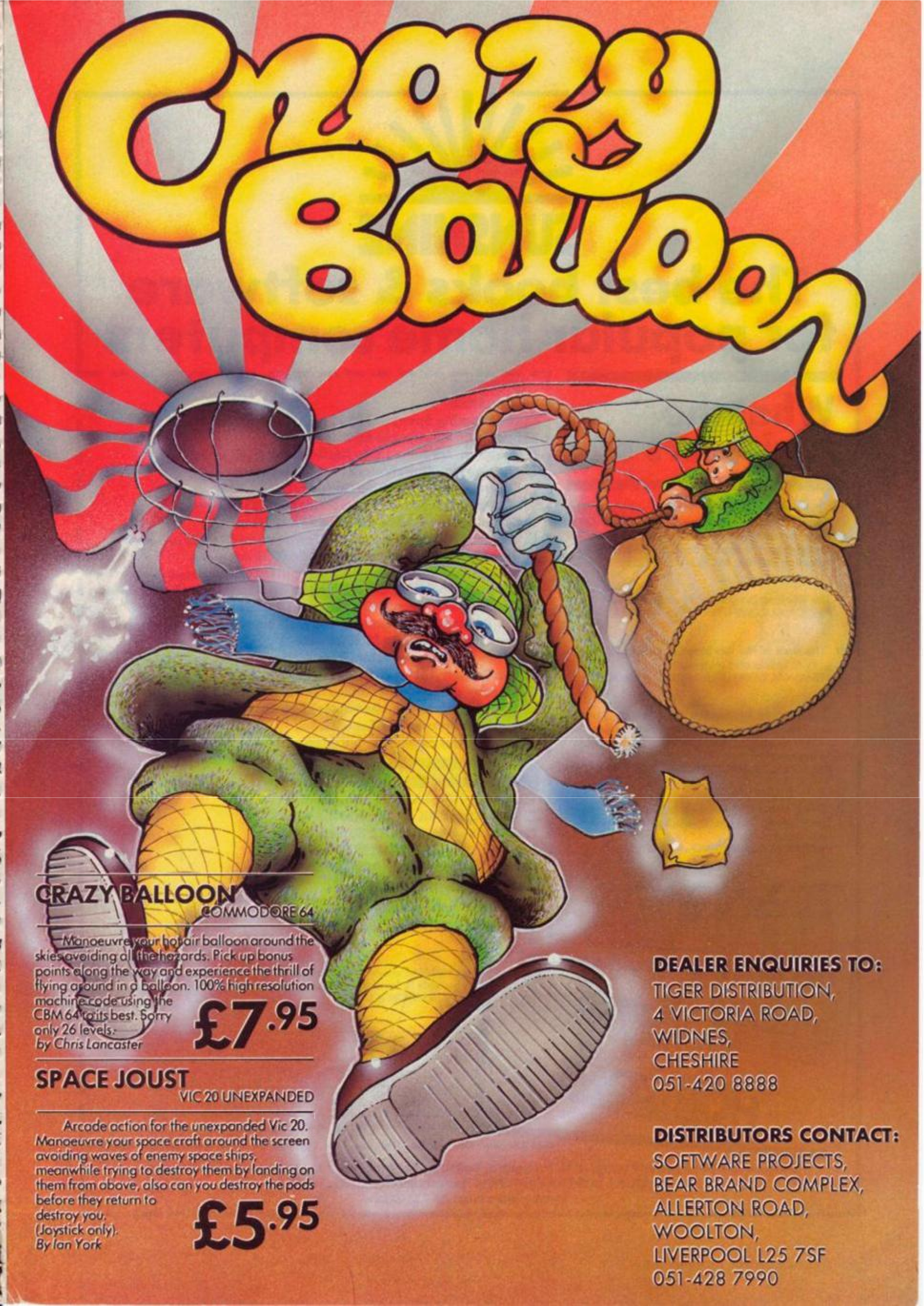
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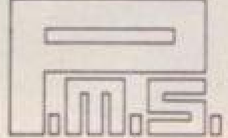
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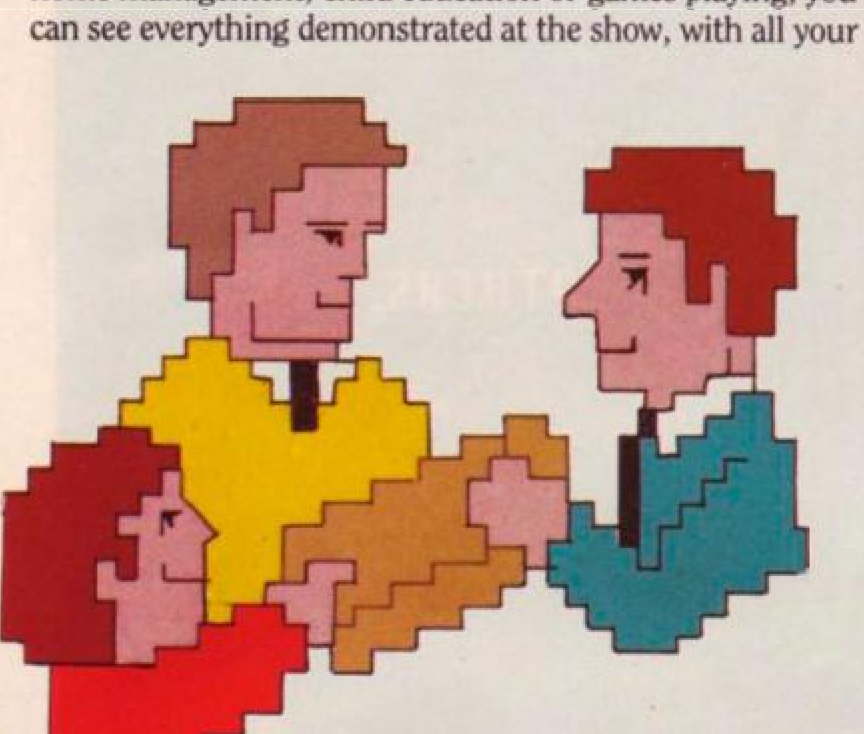
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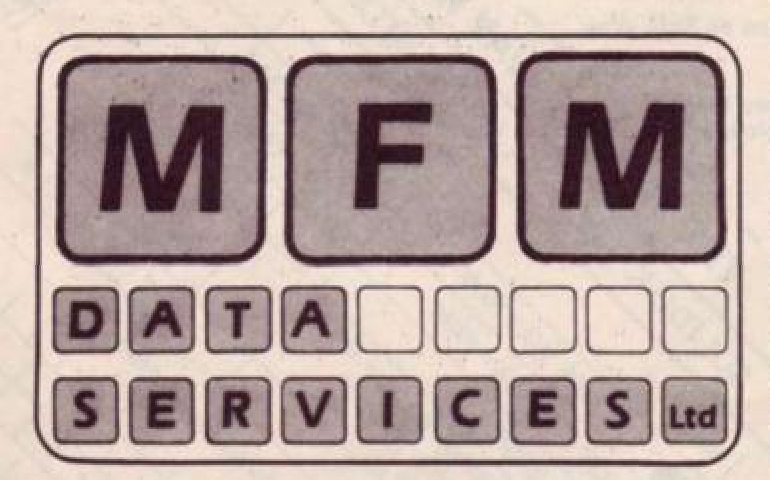
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Acorn has planned to release a similar system on the ELECTRON.
Rather than being a software piracy aid, the Side Way Ram is the key solution to selling more software to users. This is because the same programs can be sold cheaper on tape or disk rather than on ROM.
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The BBC-SOLIDISK:

The BBC-SOLIDISK is simply a memory board which is dedicated to working as a super fast disk drive. You must have at least one disk drive before using the BBC-SOLIDISK. You will not notice the presence of the BBC-SOLIDISK before booting up the SOLIDISK operating system. The computer will then display:

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BBC Computer 32K
ACORN DFS
PLUS SOLIDISK AS DRIVE 1
100K AVAILABLE

BASIC
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From now on, your system will have access to 2 disk drives: drive 0 is the floppy disk and drive 1 is the SOLIDISK. There is no functional difference between the 2 drives, since they are both controlled by Acorn's Disk Filing System. The SOLIDISK Filing System is merely added to handle read/write to drive 1.
The most striking impression when using the BBC-SOLIDISK is one of user friendliness. Not only does the system not produce any noise, or light up LEDs which may distract your attention, but also produces any file smoothly and naturally. For example, everyone will notice that when doing *TYPE, the screen stops slightly after every 256 character block. With the BBC-SOLIDISK, the screen just scrolls smoothly from beginning to end, no matter how long the file may be. Another example: when you type in the name of the program it is there before you know it! Simply mind boggling speed.
Other occasions when you will notice the speed of the BBC-SOLIDISK is when doing *COPY or *BACK-UP. Only the floppy drive will whirr away continuously, and even then the whole system will be twice as fast as a dual floppy drive system!
Users spend next to no time in getting used to the BBC-SOLIDISK, since there is nothing to be learned. Once they have tried it, they wonder how people can spend £200 for a second floppy drive!
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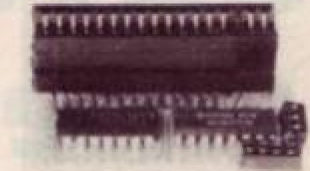
BBC-Side Way RAM:

MEMORY CAPACITY: 16K bytes, directly expandable to 32k bytes
ADDRESSING: from &8000 to BFFF in paged mode (sharing the same memory space with other Side Way Roms)
SIDE WAY PAGE IDENTITY: 15 (and 14 if expanded to 32K), write protected.
OPERATING SOFTWARE: on 40 track single density disc. (or tape at 1200 Bauds on request)
POWER CONSUMPTION: less than 300 mA/5V. No extra PSU required.
DIMENSIONS:
Cartridge base: 50mm x 27 mm x 20 mm
Rom cartridge: 45 mm x 28 mm x 7 mm
Side Way Ram Card: 190 mm x 47 mm x 7 mm

BBC-SOLIDISK:

MEMORY CAPACITY: 128K bytes, 100k bytes formatted and 16k bytes as Side Way Ram. The remaining space is reserved for the operating system.
ADDRESSING: from &8000 to &BFFF in paged mode.
SIDE WAY PAGE IDENTITY: from 8 to 15. Can be used as 8 side way RAMs
OPERATING SOFTWARE: Solidisk overlay, requires ACORN DFS release 0.90 (the only official release on DFS), available on 40 track single density floppy disk.
POWER CONSUMPTION: less than 800 mA /5V, no extra PSU required.
DIMENSIONS:
The BBC-Solidisk is the 32k Side Way Ram with a 96k Solidisk extension measuring 168 mm x 35 mm x 10 mm.

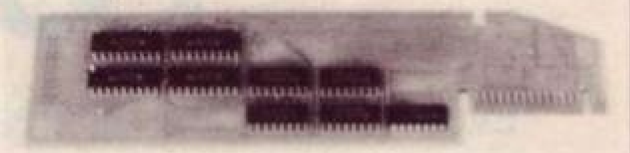
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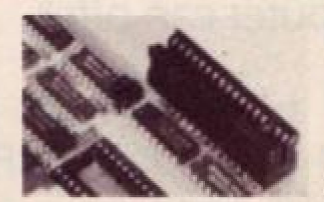
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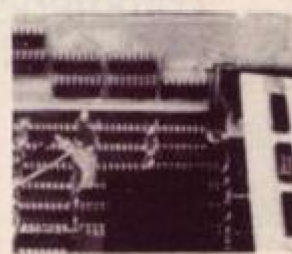




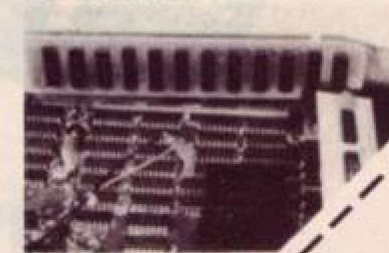
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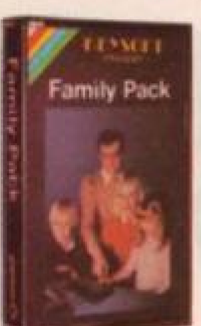
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Sarah finds her name on the Keysoft Family Tree Program

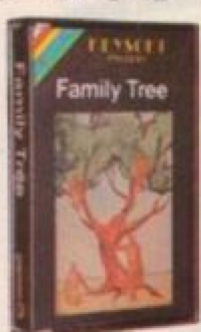
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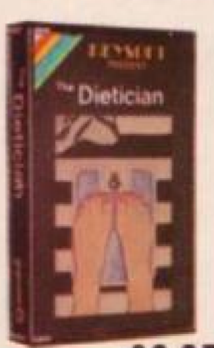
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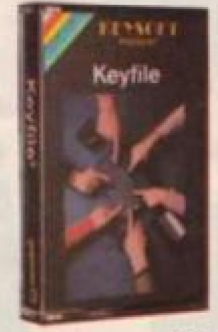
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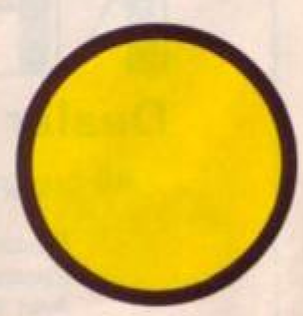
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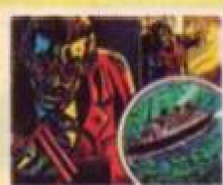
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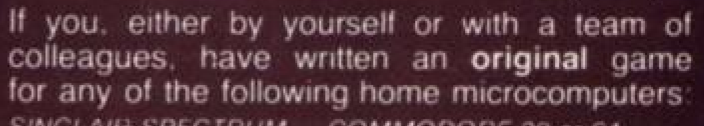
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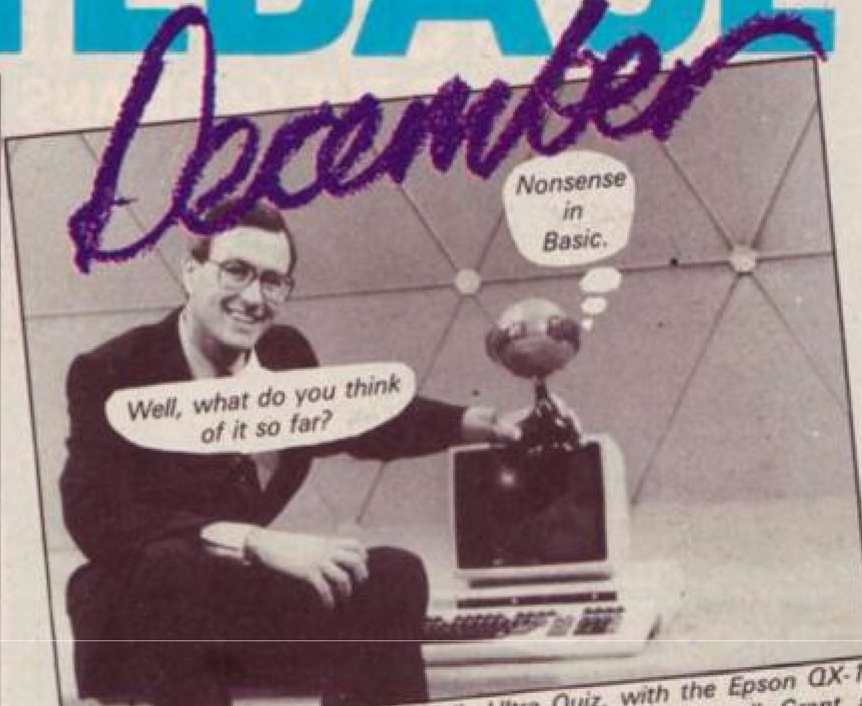
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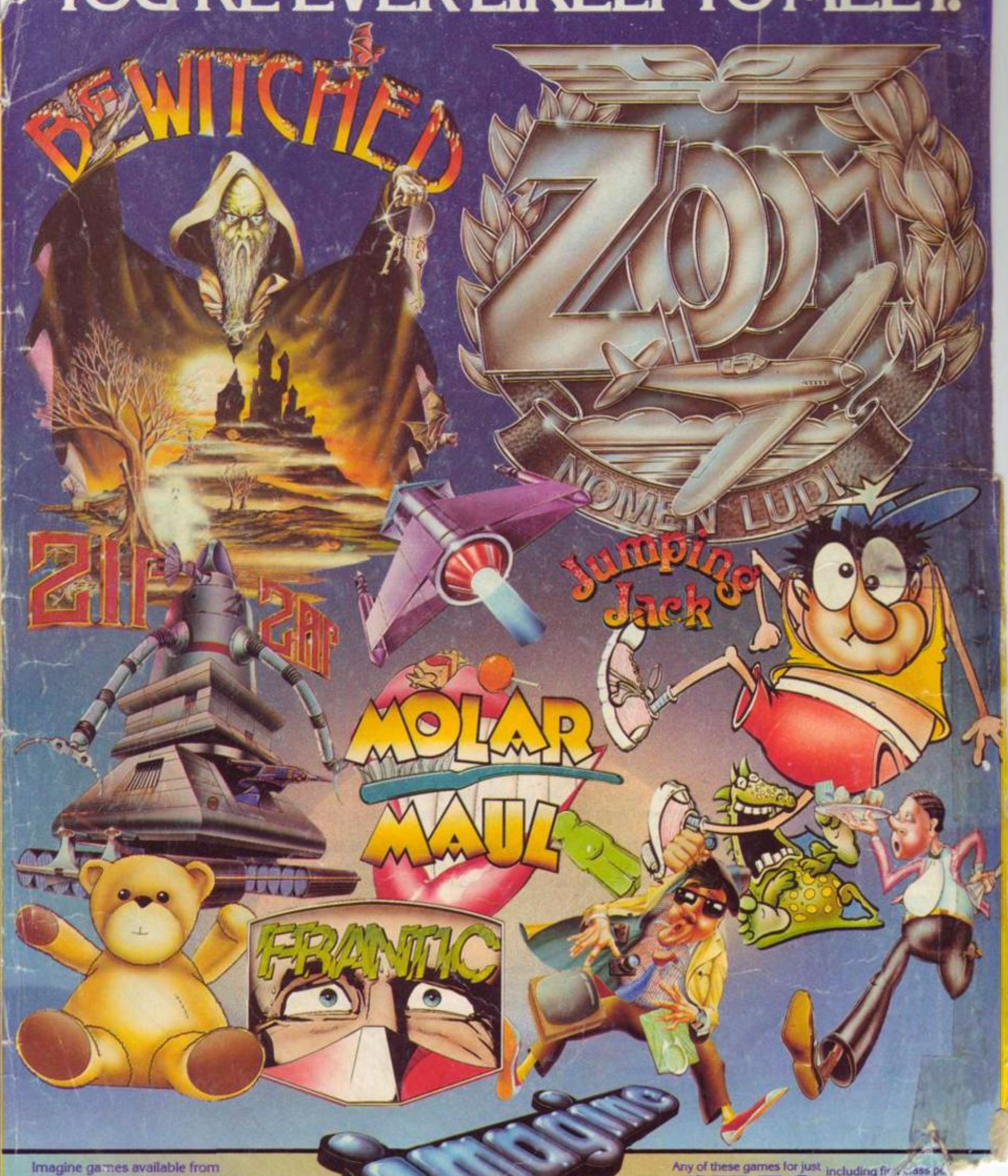
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